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THE

MARINE BOTANIST.

DELESSERIA SANGUINEA

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BY W. DICKES.

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THE

MARINE BOTANIST;

AN

INTRODUCTION TO THE STUDY

OF THE

BRITISH SEA-WEEDS;

CONTAINING

DESCRIPTIONS OF ALL THE SPECIES, AND THE BEST METHOD OF PRESERVING THEM.

BY

ISABELLA GIFFORD.

Third Edition,

GREATLY IMPROVED AND ENLARGED, WITH ILLUSTRATIONS PRINTED IN OIL COLOURS BY

W. DICKES.

BRIGHTON:

R. FOLTHORP, 170 NORTH-STREET;

LONGMAN AND CO., LONDON.

1853.

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London:
Printed by Stewart and Murray,
Old Bailey.

QK573
.G54
1853

"For love of nature dwells not in the heart
Which seeks for things beyond our daily ken,
To bid it glow. It is in common life,
In objects most familiar, we find
Exhaustless matter for our privilege,
Our glorious privilege of reading God,
Amid his bright creation."

L. A. Twamley.

ADVERTISEMENT TO THE THIRD EDITION.

In preparing this edition, I have taken every pains to make it a complete elementary guide to the study of our marine Algæ. I believe, from the growing interest which is now manifested in the investigation of these beautiful plants, that the additional information supplied both in the Introduction and in the descriptive portion of the work, will meet with general approval. Besides the descriptions of the common sea-weeds, concise notices of the distinguishing features of the rarer ones are now included, thus furnishing the student with the characters of *all* the kinds found on our shores, classified and named in accordance with the arrangement and nomenclature adopted by Dr. Harvey in the last edition of his excellent work, the

"Manual of British Algæ," to which it will be found, I trust, a useful introductory volume. The localities of the rare species (excepting in the instances where the finders' names are mentioned) are extracted from the "Phycologia Britannica," another valuable work by Dr. Harvey, containing coloured figures and descriptions of all the British sea-weeds.

It is gratifying to me to find that my efforts to simplify this study have been approved of by those conversant with the subject, and that the credit has been awarded me "of having first led attention in a simple, popular, as well as strictly scientific manner, to an interesting branch of botany previously little studied." This encouraging expression of opinion induces me to suppose that the present improved edition will meet with a cordial reception from those intending to begin the study of our rich and varied Marine Flora.

I. GIFFORD.

Parks, Minehead, April, 1853.

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INTRODUCTION

TO THE STUDY OF MARINE BOTANY.

THE marine Algæ or Sea-weeds are flowerless plants, the growth of that

> "Majestic main,
> A secret world of wonders in itself."

Their structure in many instances is exceedingly simple, consisting in some species of strings of cellules loosely adhering together; others present the appearance of branched threads, which in those kinds of a more perfect and intricate structure, are joined together and form the stem and branches. In the higher tribes many kinds possess distinct stems and leaf-like fronds, resulting from a mem-

branaceous expansion of the stem, which continues its course through the frond, and assumes the character of a midrib or vein—presenting in this instance a manner of growth nearly analogous to that of the fronds of ferns. At a later period, what constituted originally the midrib of the frond becomes a branch, as in Delesseria. Many algæ are parasitical on the larger species; others have knob-like, flat, leather-like or fibrous roots, by which they adhere to rocks, stones, shells, and other substances. It is doubted whether they derive any nourishment from these roots, which seem to partake more of the character of clasping fibres or tendrils, than of a true root. Some few species are always found unattached; of these the Sargassum bacciferum, or *Gulf-weed*, is by far the most extraordinary and well-known instance, occurring in extensive masses or lengthened ridges on the surface of the Atlantic in certain latitudes. Columbus and his companions, at the sight of this to them unwonted phenomenon, were struck with surprise and fear. "In this part," he says, "the sea was covered with such a quantity

of sea-weed, like little branches of the fir-trees which bear the pistachio nuts, that we believed the ships would run aground for want of water." They supposed, as is usually the case, that the presence of vegetation denoted the existence of shallows—

> "For where the waves are shining red,
> And the russet sea-leaves glow,
> Mariners with prudent dread
> Shun the shelving rocks below."

Various opinions have been held respecting the origin of this floating vegetation. No species of Sargassum, exactly similar to it, has been found growing on any coast, though numerous examples of the genus are common on the shores of tropical countries. According to the united testimony of botanists who have examined this plant, no roots have ever been detected, and as it but rarely produces fruit, it would appear to be propagated by the accidental fracture of the old frond, which is very brittle—the detached portion shoots out afresh, and forms a new plant; affording a vegetable parallel to the fresh water Hydra amongst animals, several portions of which will, after the lapse of a short

time, become perfect polypes. That the Sargassum should continue to exist in this manner, is not so surprising when we bear in mind that, excepting in the parasitical sea-weeds, the root does not appear to serve the purpose of nourishing the plant so much as of affording it a secure holdfast in its appropriate habitat, against the violence of the winds and waves. It is, however, surprising that only one species of algæ should be found amongst the mass: and this fact would seem to afford conclusive evidence against the supposition that there is any land now existing in its vicinity, or other species besides this particular kind would vegetate thereon. But according to the views of Professor Forbes, this Sargassum indicates land existing, or which did exist before some great geological change; and Hugh Miller, in speaking of these changes, says,—"It is not at all impossible that the long trails of sea-weed that undulate in mid-ocean to the influence of the Gulf-stream, and darken the water over an area of hundreds of miles in extent, are anchored beneath to what once formed the Rocky Mountains of this

submerged America." The Sargassum bacciferum, and another species, Sargassum vulgare, are occa sionally drifted on our Atlantic coasts; but neither of them are natives of our seas, and therefore cannot justly be included in the British Flora. The Fucus Mackaii affords a British example of the rootless algæ; it is found in several sea-water lochs in the North of Scotland, where it vegetates quite unattached, resting on the mud by its own weight. The variety β *Balticus* of Fucus vesiculosus also vegetates in like manner in salt-water marshes occasionally flooded by the tide. Several species of Melobesia, stone-encrusted algæ, are found lying on the sandy bottom of quiet bays. The *fresh-water* species of the genera Cladophora and Conferva, mostly float in detached masses on the surface of our ponds and ditches, while their marine associates are often furnished with small scutate roots. Enteromorpha intestinalis is only attached when young, afterwards it floats free on the surface of water—growing indifferently in either salt, brackish, or quite fresh water.

The fructification of the algæ consists of *spores*, either contained in conceptacles or immersed in the frond, and of *tetraspores* (spores when mature separating into four parts), which are imbedded or arranged in spots on the frond, and are very rarely contained in proper receptacles. Both these kinds of spores are too small to be seen with the naked eye; but the receptacles or other bodies (similar to the seed-vessels of flowering plants) which contain them are usually large enough to be detected without the assistance of a magnifying glass. Some plants produce both descriptions of fruits; when such is the case, the *spores* are described as the *primary*, and the *tetraspores* as the *secondary* fruit. These terms are employed to give greater clearness in the descriptions, and not to convey the idea that one form is of more importance than the other, as each are alike capable of producing a new plant. Many species of the Fucaceæ are furnished with air-vessels, which buoy up their fronds in the water; in the Fucus vesiculosus these vesicles are particularly abundant, arising within the substance of the

frond on each side of the midrib. The Sargassum bacciferum derives its specific name *bacciferum* from the abundance and form of the air-vessels, which are currant-shaped and borne on short stalks; and takes its French popular appellation of *Raisin des Tropiques* from the same cause. None of the British species of the Laminariaceæ bear air-vessels, but exotic members of the order are often furnished with them of large size. The Nereocystis, a species vegetating on the shores of the North Pacific, with a slender stem upwards of 300 feet long, bears at its extremity a large air-vessel shaped like a barrel, six or seven feet in length, crowned with a tuft of upwards of fifty forked leaves, each thirty to forty feet long: upon this, Dr. Henry Mertens tells us, the sea-otter has its favourite lair—resting himself on the vesicle, or hiding among the leaves while he pursues his fishing.

The geographical distribution of our marine Flora, has been separated into distinct zones or belts by writers on the subject. We have first the *Fucal* or *Littoral* zone, comprising the space laid

bare by the reflux of the tide, which is marked in its upper part by the growth of Fucus canaliculatus, Catanella opuntia, Enteromorpha compressa and intestinalis, with other species that are not impatient either of exposure to the atmosphere, or hurt by the streams of fresh water that take their course over the beach at this height. Lower down, the Fucus vesiculosus is the most frequent kind, and is again replaced by the Fucus serratus and nodosus. Below low-water the Fuci begin to disappear, and the *Laminarian* zone commences. In this we have species of the largest size known in our seas, with long stems and large ribbon-like fronds; their stems are clothed with many beautiful parasitical algæ, and among them live myriads of peculiar forms of animal life. In sandy places the Laminariæ are replaced by Zostera marina, grass-wrack, the only example among our submarine vegetation of the phenogamous or flowering plants. The *Laminarian* zone extends to about fifteen fathoms; at this depth, in quiet water, the string-like Chorda extends its long slender fronds,

reaching at times the enormous length of forty feet—but at this depth in general the large sea-weeds are comparatively few, and the prevailing plant is the curious coral-like Melobesia. The vegetable forms now become more rare, and the plant-like zoophytes assume their place when we enter upon the *Coralline* zone, a district in which the vegetable kingdom finds few representatives, but many counterfeits among the zoophytic forms of animal life.

Before quitting the subject of the distribution of the algæ, it may be well to remind the reader that wherever deep pools are left on the recess of the tide, in them species not usually growing at such a height will be found. A shore on which rock-pools are numerous, about mid-way on the beach, will generally be productive of a variety of species which otherwise might only be procured on the rocks laid bare during the lowest tides.

Similarity of colour in marine plants is a characteristic feature that often accompanies plants of an allied structure. Thus the olive-green series (Me-

lanospermeæ) contains sea-weeds of the largest size, if not of the most complex structure; some have the frond developed into a distinct stem with leaves and receptacles containing the spores. The red series are remarkable for the delicacy of their tissue, and for possessing a double system of fructification, that is, producing both *spores* and *tetraspores*, while the grass-green series (Chlorospermeæ) possess the simplest structure, and their *seeds*, at certain periods, are endowed with a singular power of locomotion, whether voluntary or not is still a matter of dispute amongst botanists. Though the colour may often serve as an index whereby to determine the series, &c., to which a species belongs, the young student must be careful not to trust too implicitly to this guide, taking care to collect such plants as grow in a favourable situation for the development of their natural hues. Many of the red series, when growing in unfavourable situations, assume a yellowish-green, or whitish colour. "Laurencia pinnatifida," Dr. Harvey observes, "is particularly variable in this respect. When this species grows

near low water-mark, it is of a fine deep purple-red; a little higher up it is a dull purple-brown; higher still a pale brownish-red, and at last, near high water-mark, it is often yellowish or greenish. Chondrus crispus, too, when found in shallow water, is often of a bright herbaceous green; and Ceramium rubrum passes through every shade of red and yellow, and at last degenerates into a dirty white before it ceases to grow. All these species vary in form and size as they do in colour, and the various anomalous shapes that they assume are almost sure to deceive a young botanist into the belief that the varieties are so many different species." The Cystoseira ericoides, when seen growing under water, appears clothed in the most beautiful rainbow hues, but when removed from thence is found to be of a dark olive-green colour. A few others possess this remarkable property, which is termed iridescent. *Form* in the generality of the flat-fronded algæ is a character of little value; plants of the same species differ at times widely in this respect. Deep-water specimens will be found

to have the segments of their fronds split into many divisions: this is the case in the variety *Sobolifera* of Rhodymenia palmata, also in the varieties of Chondrus crispus, and Gracilaria multipartita; their fronds, when grown in similar situations, become narrow, and differ greatly in appearance from examples of the same species taken from shallow water. An attentive observation of the disposition and structure of the fruit is the surest means of ascertaining the order and genus to which the plant should be referred; for upon the structure, &c., of the fructification of the algæ is based the classification of these plants. In default of fruit, the student must have recourse to the investigation of the structure of the plant itself: usually, however, each species has peculiar characters in its appearance and habit which, after a little experience, will soon enable him to recognize it, and distinguish it from others. And it has been observed of the algæ that they are more frequently separated from their place of growth, and cast ashore during the period of their fructification, than at any other time—this in

a great number occurs through the summer months, while in others it takes place in winter and spring.

In enumerating the different uses of sea-weed, its importance to the various animals inhabiting the sea first claims attention. Innumerable animalcules, the principal food of the whale and of many species of fish eaten by man, derive their sustenance from the algæ, which is as necessary to them as the vegetation of the land is to the different living creatures upon it. Thus—

> "Huge Ocean shows, within his yellow strand,
> A habitation marvellously planned,
> For life to occupy."

The following observations, made by Capt. Grey* during the course of his homeward voyage from Australia, are interesting in connection with this subject, and also as relating to animals of whose habits and means of existence we have, from the nature of the element they inhabit, but little acquaintance. "In 26° N. lat., we entered a portion

* See Capt. Grey's "Australia" (Voyage Homewards), Nat. Hist. p. 176.

of the sea covered with patches of sea-weed, around which swarmed numerous eel-like fish, crabs, shrimps, and little blue fish. These last swam under those floating islands, sometimes leaving them for a little distance—but they always returned, or swam to another. The crabs crawled in and out amongst the sea-weed, and other fish of a large size came to these spots to deposit their spawn; so that we were in an archipelago of floating islands, teeming with busy inhabitants, and animal enjoyment. Aug. 30th, a pine-tree passed us, covered with barnacles and surrounded by fish which swam about this floating island, eating such things as fell from it. No portion of the globe is more thickly inhabited, or affords, in proportion to its size, a greater amount of animal enjoyment than did this wave-tossed isle. On it were innumerable barnacles, several species of teredo, one of which, having its head shaped like a screw divided into two equal portions, I believe to have been quite new. Many varieties of crabs, and minute insects shaped like a slug, fed on the sea-weed growing on the log."

A description which reminds one forcibly of that given by Milton in his account of the Creation, where he says—

"Forthwith the sounds and seas, each creek and bay,
With fry innumerable swarm, and shoals
Of fish, that with their fins and shining scales
Glide under the green wave, in sculls that oft
Bank the mid sea: part single, or with mate
Graze, the sea-weed their pasture, and through groves of coral stray."

The different naturalists who have accompanied the various exploring expeditions which of late years have left our shores, have furnished us with many descriptions similar to Captain Grey's, all tending to show that wherever vegetation occurs in the ocean there organic life abounds. Hosts of small marine animals live among the Sargassum found floating in the Southern branch of the Gulf Stream; the late George Gardner, in his "Journal of the Voyage Home from Brazil," notices also the variety of zoophytes, crabs, &c., living amongst this weed—thus in mid ocean do we find a wonderful provision made for the sustenance of herbivorous

animals. "Our woods on shore," Mr. Darwin says, "do not harbour so many animals as the woody regions of the ocean, where the sea-weed groves, rooted to the shallows, or the Fuci, detached by waves and currents, supported by air-cells, and swimming free, unfold their delicate arms and branches;" and furthermore he affirms, "that if the immense sea-weeds of the Southern Ocean were removed by any cause, the whole Fauna of these seas would be changed." The fact of pilchards on the coasts of Cornwall having forsaken the shallow water within coves, where they were formerly caught in great abundance, and are now but rarely seen, is fully proved by the investigations of the Messrs. Couch to be attributable entirely to the practice of the farmers, who cut the sea-weed from the rocks, for the purpose of manuring their lands. By this means they destroy all the small Crustaceans inhabiting these immature marine forests, feeding on the algæ, and as they constitute the principal food of the pilchards, these leave their old haunts for more favourable situations. It is supposed by

geologists that the algæ were amongst the first vegetable productions which appeared during the ancient Silurian epoch, they, along with a few shells and crustacea, are the earliest organized substances met with in the fossiliferous rocks of that period. In the Silurian limestone of North America entire layers of rock are formed of a large digitate species of fucus, named Fucoides Alleghaniensis; and in Sweden, Russia, and the Lake districts of England, fucoids occur to the exclusion, so far as is yet known, of every other vegetable form; and such is their abundance, in some localities, that they render the argillaceous rocks, in which they lie diffused, capable of being fired as an alum slate, and exist in others as seams of a compact anthracite, occasionally used as fuel. They also occur in those districts of Wales in which the place and sequence of the various Silurian formations were first determined, though apparently in a state of keeping from which little can be premised regarding their original forms. During the Red Sandstone period, from the abundance of their remains, Hugh Miller tells us the sea

bottom must have sustained miniature forests of algæ, while its waters were darkened by immense shoals of fish. Again, Fuci abounded in the seas of the Cretaceous era; the fossil forms of the Conferva (Confervites) are occasionally met with in transparent quartz pebbles, and in chalk. We learn from the abundant distribution of the fucoidal remains throughout these deposits, that long ages ago, ere the earth was inhabited by man, the vegetation of the ocean flourished in the same luxuriant beauty, and formed, in like manner as it now does in our seas, the food and shelter of animal life.

The Fucus vesiculosus affords excellent winter provender for cattle. Turner says, "In the islands of Jura and Skye they regularly feed upon it during winter." It is the *Küe-tang* of Norway, and cow-weed of the north-west of Scotland and the west of Ireland; in Gothland the people boil it with coarse flour, and feed their pigs upon it, whence they call it *swine-tang*. Dr. Drummond observes, that "It is much used by the poorer classes about Larne

(near Belfast) for feeding pigs. Boiling water being poured upon it, which softens and renders it glutinous, it is then mixed with greens and potatoes, or even given by itself. Many persons have assured me that the pigs are not only very fond of it, but that they thrive upon it remarkably well." And at Minehead, on the Somerset coast, I find that the poor occasionally gather it for their pigs, giving it to them partially boiled, along with oatmeal or bran. Fucus serratus is also used as winter provender, and in Norway is called *bred-tang*, being given to the cattle sprinkled with meal. During the severe winter of 1847, many of the poor along the western and north-west coasts of Ireland, subsisted almost entirely upon sea-weed, probably the *dulse*, Rhodymenia palmata, which is by far the most abundant edible species; it is the *dulliosg* of the Highlanders, and *dillish* of the Irish. After being soaked in fresh water it is eaten, either boiled or dried, and in the latter state it has something of a violet scent and flavour. In the Islands of the Archipelago it is a favourite ingredient to ragouts, imparting a red

colour, as well as rendering them of a thicker and richer consistence. Sheep and goats are said, in Norway, to be exceedingly fond of it, frequenting the sea shore at ebb-tide, in order to obtain it—whence it is there known as *sou-söll* or *sheep's-weed.*

Iridæa edulis is sometimes eaten by the poor, either raw or cooked in the frying-pan. Alaria esculenta is said to be much eaten in Scotland, and frequently exposed for sale in the markets, along with the young fronds and stems of Laminaria digitata and saccharina. The Chondrus crispus and Gigartina mamillosa constitute the Carrageen or Irish moss of the chemist's shop, which when bleached white, and boiled into a jelly, forms a nutritious article of food for invalids and delicate persons. When properly prepared it is nearly as agreeable to the taste as calf's-foot jelly or blanc-mange. The demand for this article has of late years decreased—at one time the price was as high as 2*s.* 6*d.* per pound. Dr. Harvey states that it has been tried as a size by the calico-printers, but he

believes has not been found to answer well for their purposes. Boiled into a jelly and mixed with milk, he says, it has been more successfully employed in fattening calves. Porphyra laciniata and vulgaris are sold under the name of *laver* in England, *sloke* or *slokaun* in Scotland and Ireland; it is eaten after being well boiled down to a pulp, to which is added a little lemon-juice or vinegar—thus prepared it forms an agreeable vegetable, with something of the taste of tomato sauce. In China, under the name of *Agal-agal*, various species of Gracilaria are collected in large quantities, and formed into jellies or mixed with acid fruits. Mr. Adams, in the Natural History account in "Belcher's Narrative," speaks of it being thus used at Seychelles and Mauritius, and of its producing a very agreeable food for invalids. "It forms," he writes, "a considerable article of trade with the Chinese, particularly in the northern provinces of Chin-chew, where it is manufactured into a bright, substantial, transparent, yellow jelly, and is sent in boxes of about ten pounds each, to Canton. The gum or paste made

from it is supposed to possess the advantage of being unpalateable to insects or worms. It is from this gum that their fancy lanthorns are fabricated by spreading it over gauze skeletons—it thus resembles and is frequently taken for highly transparent horn. It is peculiarly brittle, even more so than glass, cracking under very slight changes of temperature." In describing the attire of a chief who visited the vessel at the Korean Islands, the same writer says, "The hat, composed of the fine outer fibres of the bamboo, dyed black, and woven into a gauze like our finest wire-work, is also furnished with a fine covering composed of very fibrous paper so well glazed, at the same time so flexible, that it was generally mistaken for oil-silk. This is prepared both by the people of Loo Choo as well as the Chinese, from a solution of the gelatinous sea-weed, Agal-agal." According to this author, the *edible* swallow's-nests, so much prized by Chinese epicures, the finest of which are said to sell for their weight in gold, are constructed of it, and not of an animal gelatine, as is now generally believed. "The

Malays," he says, "frequently assert that the nests are formed from the bodies of certain sea-snakes, but there is no doubt that *Agal-agal*, a marine cellular plant, is the material employed." * On every shore we find the natives acquainted with edible species of sea-weed: the New Zealanders make a palatable sweetmeat from some kind mixed with the juice obtained from the "Tutu" berries, and employ the pods (air-vessels) of another large species, for conveying whale-oil in, tying up the mouth with flax. Each pod, it is stated, holds upwards of a quart, and resembles in appearance a bottle of caoutchouc. Sarcophycus potarum is used as food by the natives of Australia, and portions of its great leaves, folded into the form of a pouch, have been observed to be employed by them for the purpose of keeping fresh water in. The stems of Lessonia, which grows abundantly on the shores of the Falkland Islands, are made into knife-handles by the Guachos; in the Orkneys the stems of Laminaria digitata are made

* See, for further account of these nests, &c., "Belcher's Narrative," vol. ii., p. 435.

use of for the same purpose—when dried and tipped with metal, they are said to be hardly distinguishable from horn. The natives in the Sandwich Islands, and along the coasts of the Pacific, are said to gather many species of sea-weed for food. The cord-like stem of the Nereocystis is used as a fishing-line by the native tribes on the north-western shores of America, and the large hollow stem of Ecklonia buccinalis, *trumpet-weed*, which grows at the Cape of Good Hope, is, we are told, often used as a siphon in that colony, and by the native herdsmen is formed into a trumpet for collecting the cattle at evening.

As a manure, sea-weed is much valued by the dwellers along many of our sea-shores. On the west of Ireland the poor eagerly collect all that is thrown up after heavy storms, for manuring their potatoes with. The kinds they prefer for this purpose, Dr. Harvey says, are the large and succulent Laminariæ, which rapidly melt into the ground, and when these are abundant, other kinds are neglected. But it is in the Channel Islands that the

vraic or sea-weed harvest is looked forward to with the greatest anxiety. "In Jersey," writes the author of a work descriptive of that island, "the time of gathering this manure is fixed by the legislature, and is restricted to twice in the year, except when boisterous weather may have detached portions from the surrounding rocks and driven it on the coast, and even the gathering of this is controlled by authority. The time of general vraicking is fixed to commence some time about the middle of March, and towards the end of July: it lasts about ten days. It is a scene of great interest to the islanders, and one of amusing bustle to the stranger. Parties of eight or ten persons usually associate and agree to assist each other. They provide themselves with a short scythe, not unlike an English reap-hook, and a thick covering for the leg, to protect it from accidents. The provender for the day usually consists of cakes made for the occasion, called "vraicking cakes," and a keg of cider. Thus accoutred and provided, they proceed to the coasts with carts, and thence to the rocks which are ac-

cessible; but as the tide flows, or when the scene of labour is among the more distant rocks, boats are employed to bring the rich boon to the shore. It is not only a season of interest, but of great merriment—as is the harvesting in England, so is the vraicking in Jersey; and if some of the noviciates get a few tumbles, occasioned by the slippery nature of their standing, it only adds to the merriment at the time, and serves for amusement when the labours of the day are finished." In Scotland it is known under the name of *sea-ware*, and is much used in enriching the coast lands. We are told by agriculturalists that it is an excellent manure, and has not only a wonderful effect in enriching light soils, but in making them produce more grain than even the appearance of the crop would warrant. It may be employed with advantage in all situations, excepting on clay soils in wet weather, or to land recently laid down with grass-seeds; neither should it be applied to young clover plants. No time should be lost in spreading it over the ground as quickly as possible, or the beneficial gases will

evaporate; this is so well known in Scotland that we find an old adage current there respecting it, saying, "Better unled than unspread." To leave it to ferment in heaps, as is often done, is allowing the most valuable qualities to escape, especially when exposed to heavy rains — the saline particles are washed away, and it becomes nearly worthless. Both cattle and sheep are said not only to eat with avidity the grass on which it is spread, but thrive faster, and are sooner fattened, than on grounds to which it is not applied. Sea-weed is also found to be a very good manure for most garden vegetables; large crops of onions are raised on ground well supplied with it; artichokes are said to thrive wonderfully in the Orkney and Shetland Isles, where they are largely manured with sea-weed. When mixed with stable-litter and sand, asparagus succeed excellently in it; and a lady resident on the Norfolk coast informs me that she has found it quite as good as stall-litter, for forcing sea-kale by Christmas, "the only care necessary is not to let it *heat* too

fast." On the north of Scotland, and in some parts of England and Ireland, the collecting and cutting of the large Fucaceæ is carried on for the purpose of being made into *kelp*, which is an impure carbonate of soda, employed in the process of glass-making, and for the purpose of soap-boiling. After being well dried, the sea-weed is then burned in pits or ovens lined with stones, till it becomes a solid mass, which is broken by the means of iron bars into large pieces, and sent to market in this state. Fucus vesiculosus or *kelp-weed* is by far the most productive kind—from five ounces of the ashes, it is affirmed, may be procured two ounces and a half of fixed alkaline salts. Iodine also, a valuable medicine in diseases of the glands, is obained almost exclusively from the plants of the Fucaceæ. It was discovered in the year 1811, by the late M. Courtois of Paris. "Without his genius and labour," writes M. Claudet, "the beautiful discoveries of the Daguerreotype and Talbotype processes would never have been made, for iodine

is their fundamental principle." It is supposed to exist principally in the mucus of these plants—the mucilaginous receptacles of Fucus vesiculosus, after being soaked in brandy, I have seen used in France as an external remedy in cases of sore throat; probably the beneficial effects arise from the presence of iodine. Among the poor on the Somerset coast, they are frequently used in hot sea-water in cases of rheumatism and sprains. In the Channel Islands, the Fuci, and stems of the Laminariæ, after being dried, are used as fuel, and for smoking bacon and fish, to which they impart a most peculiar flavour.

Having noticed the most important uses of these plants, it would be a matter of little interest to the reader were I to detail the minor ones to which they are applied. Nor is it necessary for me to dilate upon their varied hues, and often singularly beautiful forms, which by the botanist and true lover of nature, can never be viewed without admiration and pleasure. The pages of the great Book of Nature lie open before our eyes, and he who attempts

with an earnest and persevering spirit, to read but a few lines from thence, will see the Almighty Power alike evident in the smallest as in the greatest of His works, will see in all things the beautiful order and regularity that rule alike o'er the immense planet, and the lowliest plant.

SERIES I.

MELANOSPERMEÆ.

THE OLIVE-GREEN SERIES.

Marine plants of an olive-green, or olive-brown colour. Fructification monœcious, or diœcious. *Spores* either external or contained, singly or in groups, in proper conceptacles. *Antheridia* (transparent cells), contain small active bodies moving by means of vibratile cilia.

ANALYSIS OF THE TRIBES.

1 { Sea-weeds of an olive-brown or blackish-green colour. Fucaceæ.
Sea-weeds of an olive-green or yellowish-green colour 2

2 { Fronds membranaceous, inarticulate . 3
Fronds articulate 5

3 { Spores external borne on jointed filaments Sporochnaceæ.
Spores on the surface of the frond . 4

4 { Spores covering the whole of the frond, or in ill-defined patches. Laminariaceæ.
Spores grouped together in well-defined spots or lines. Dictyotaceæ.

5 { Fronds composed of articulate filaments interlaced together. Spores immersed. Chordariaceæ.
Fronds filiform-jointed. Spores external. Ectocarpaceæ.

In this scries of the Algæ are included the largest known examples of marine vegetation; these grow in deep water, but the majority of the olivaceous kinds are found about half-tide level: when growing in deep water, they become either of a brown or nearly black colour; the *olive* hue is, however, generally observable in them, and it is only during the process of decay that they ever assume a grass-green tint; this is the case in the Sporochnaceæ, which soon change from a yellow-green to a verdigris-green, when exposed to the air. The Fucaceæ are characterised by tough and leathery fronds, often furnished with air-vessels; they are not remarkable for their delicacy or beauty, but their fructification is distinct and well developed, and affords an interesting field for microscopic observations. The Fuci may truly be termed the *weeds* of our shores, occurring as they do in such frequency, growing indifferently on all substances between tide marks. Fucus Mackaii is the only rare species, and this is confined to the north of Ireland and Scotland. Omitting

Sargassum, no species of which are indigenous on our coast, we have four British genera included in the Fucus tribe. The Sporochnaceæ are remarkable for their delicate fronds speedily changing colour and becoming flaccid on exposure to the atmosphere. Six species comprised in four genera are known on our shores, of which the Desmarestiæ are alone frequent, and these, our three native kinds, are widely dispersed through the Atlantic and Pacific Oceans. In the next tribe of the Laminarias are found sea-weeds, attaining the greatest size of any vegetating in these seas, their stems and fronds together often measure eighteen feet in length, and the string-like Chorda frequently has fronds forty feet long; but it is on the shores of the Pacific, along the north coast of America, and for a greater distance, that an immense alga of this tribe grows to the astonishing dimensions of one thousand feet: large submerged meadows are formed by this Macroscystis, so dense, that it is with difficulty ships will answer to the rudder when steered through the mass; and during the

prevalence of southerly gales, it is uprooted, and chokes up all the harbours and bays along the coast. On the Fuegian shores, species of the genus Lessonia are particularly abundant; they resemble in their growth submerged forest trees: among their branches harbours an infinite variety of animal life, and beautiful species of parasitical algæ grow on their long woody stems. Nor are the humbler forms of our *Tangles* (Laminarias), without inhabitants; various kinds of Molluscæ, Crustaceæ, &c., harbour in their fibrous roots; and the stems of Laminaria digitata are generally adorned with a luxuriant growth of the smaller and more delicate species of parasitic sea-weeds. The tribe of the Dictyotaceæ are distinguished by the net-like appearance of the surface of their fronds when viewed through the miscroscope. Many of the more rare and beautiful among the flat-fronded species flourish along the southern shores of England and Ireland.

Dictyota dichotoma is about the commonest species, and the curious Padina Pavonia is the

rarest, if we except Zonaria collaris, a new addition to our Flora, which has only lately been found by Miss Turner, in Jersey. Twelve genera are comprehended in this tribe; the succeeding one, Chordariaceæ, contains but half that number: the fronds in these plants consist of articulated filaments more or less combined together: in Chordaria and Mesogloia, the frond is cylindrical, and branched; tuber-like, in Leathesia; orbicular, with a dense structure, in Ralfsia: the genera Elachista and Myrionema consist of parasitical species; the former composed of free articulated filaments, rising from a cartilaginous base: the members of this genus are mostly parasites on particular species of the Fucaceæ: the Myrionema are found on various algæ, occurring in patches on their fronds, and composed of erect, simple filaments, springing from a thin expansion of filaments cohering together; in *structure* these two genera show an approach to the Ectocarpaceæ; but their *fructification* manifests a close resemblance with Leathesia, which will not allow of their being re-

moved from the Chordariaceæ. Among the Ectocarpus tribe are classed the simplest in organization of the olive-coloured sea-weeds; they are arranged into two sub-orders; in the one are placed those genera whose fronds are rigid, and in which the articulation is composed of several cells, and in the other, those with flaccid fronds and single-celled articulations.

FUCACEÆ.—THE FUCUS TRIBE.

"Olive-coloured, inarticulate sea-weeds, whose *spores* are contained in spherical cavities immersed in the surface of the frond."

In these plants the receptacles containing the seed cavities usually form distinct portions of the frond: in the Fuci, they are large, and placed a the tips of the fronds; their surface is pierced by minute pores which communicate with the conceptacles; these contain either spores or antheridia, or both together; the former are supposed to be analogous with the *seeds* of more perfect plants, while the latter represent the *stamens;* they consist

of an oblong cell, borne on jointed threads termed *paranemata;* each *antheridium,* or cell, is filled with minute orange-coloured bodies, closely resembling the zoospores of the lower algæ, and, like the latter, are endowed with spontaneous movements. The organs of motion are the same—vibratory hairs or cilia, two of which are attached to each. These details the reader will observe cannot be verified without an appeal to the microscope. The majority

"Of ocean weeds heaped on the surf-beaten shore."

belong to this tribe, for all along our shores the Fuci grow associated together in dense masses, and constitute the prominent feature of sea-side vegetation. Kelp is largely manufactured from them, and this in turn yields several products, such as saltpetre, iodine, pearlash, &c.* The genus Lichina, which was formerly placed after this tribe, is now included among the true lichens with which the fructification of these plants accords.

* Vide Appendix, for further account of the products of kelp.

GENERA OF THE FUCUS TRIBE.

Halidrys. Air-vessels stalked, long, pod-shaped.

Cystoseira. Air-vessels in the branches. Receptacles small.

Pycnophycus. Root composed of branching fibres. Receptacles cellular.

Fucus. Root a round or flattened disk. Receptacles large, filled with mucus traversed by jointed threads.

Himanthalia. Frond round, small, and cup-shaped. Receptacles resembling fronds, very long, and repeatedly forked.

HALIDRYS.

Name signifying sea-oak.

Frond compressed, coriaceous, linear, pinnated with distichous branches. *Air-vessels* lanceolate, stalked, divided internally into several cells by transverse partitions. *Receptacles* lanceolate, terminal, stalked, the surface pierced by pores which communicate with internal spore-cavities.

HALIDRYS SILIQUOSA. — POD-BEARING HALIDRYS.

The fronds of this plant vary from one to four feet in length, the branches are narrow and set in the upper part with the long flattened pod-shaped air-vessels and receptacles. Colour dark olive; black when dried. Substance tough and leathery. Perennial. Winter and Spring. Common on rocks and stones in the sea, at and below half-tide level. The var. β minor smaller in every part, with fewer air-vessels, is found in shallow pools left by the tide.

CYSTOSEIRA.

Name meaning a *chain* of *air-vessels*, in allusion to the disposition of the vesicles in these plants.

Frond much branched, occasionally leafy at base; *branches* becoming more slender upwards, and containing strings of simple air-vessels within the substance. *Receptacles* small, terminal.

CYSTOSEIRA ERICOIDES.—HEATH-LIKE CYSTOSEIRA.

A rigid and very bushy sea-plant, thickly set with small spine-like ramuli, or leaves; the air-vessels are small, and mostly solitary, in the upper branches. Colour olive-green; but when seen growing under water, appears clothed in the most beautiful iridescent hues. The root is a very hard disk, and the fronds are from one to two feet in length. Perennial. Summer and Autumn. Grows on rocks between tide-marks; frequent along the shores of Devon and Cornwall, and the western and southern coasts of Ireland. Yarmouth Beach. Bill of Portland. Port Rush, north of Ireland.

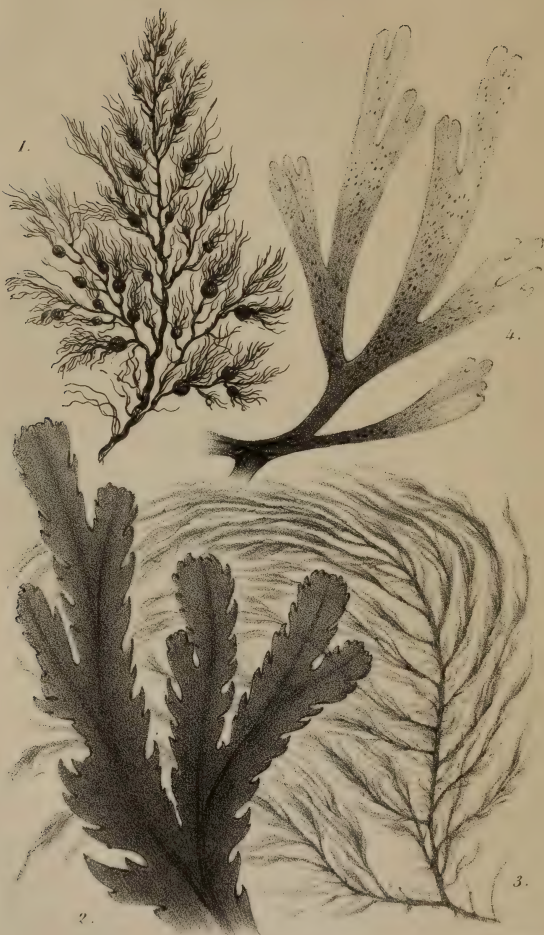
CYSTOSEIRA GRANULOSA.—GRANULATED CYSTOSEIRA.

Stem seven or eight inches high; branches slender, and much divided, with hard knob-like substances at the base of each; this latter cha-

racter sufficiently distinguishes it from all the other British species. Cystoseira barbata, a native of the Mediterranean, which has also knobs on the stem, is reported to have been gathered on the coast of Devon by Hudson, but it has never been noticed on that coast since, and probably is little entitled to be ranked as a British species. The air-vessels in Cystoseira granulata are placed two or three together in the upper branches. Colour a nearly transparent olive-green. Perennial. Summer. Grows in rocky pools left by the tide on the coasts of England and Ireland; not uncommon. Aberfraw. Anglesea. Jersey.

CYSTOSEIRA FŒNICULACEA.—FENNEL-LIKE CYSTOSEIRA.

Stem from four to six inches, bearing many long and nearly simple branches, mostly naked toward the base, but thickly set in the upper part with alternately pinnate, or partially forked branchlets.



W. DICKES, Litho.

Fig 1. CYSTOSEIRA FIBROSA

2. FUCUS SERRATUS.

Fig 3. DESMARESTIA ACULEATA.

4. DICTYOTA DICHOTOMA.

When young, and growing in deep water, this species bears luxuriant leaves; these, Mrs. Griffiths, and other observers, have recorded, eventually elongate, and become the branches. Air-vessels small, one or two together, near the tips of the branches. Perennial. Summer. Grows on rocks in tide-pools on the south and south-west shores of England. Coast of Sussex. Isle of Wight, and Jersey. Weymouth. Sidmouth. Torquay.

CYSTOSEIRA FIBROSA.—FIBROUS CYSTOSEIRA.

Very bushy; branches densely clothed with narrow, flat leaves. Stem generally undivided; frond three feet in length or upwards; the terminal ramuli are long, and bristle-like. Air-vessels mostly solitary, situated in the branches, and remote from the tips, larger than in other British species of Cystoseira. Colour dark olive-green. Perennial. Summer. Grows on rocks near low

water-mark, and in tide-pools, also in deep water. Frequent on the shores of England and Ireland, but not found in Scotland.

PYCNOPHYCUS.

Name meaning thick sea-weed.

Root branched. *Fronds* cylindrical. *Receptacles* cellular, terminal, pierced by numerous pores.

PYCNOPHYCUS TUBERCULATUS.—TUBERCLED PYCNOPHYCUS.

Fronds growing crowded together, from twelve to twenty inches in length, repeatedly forked; the receptacles are produced at the ends of the branches, and the air-vessels are rarely seen, excepting when the plant grows in deep water. Colour a clear olive. Substance brittle when dry. Perennial. Summer and Autumn. The roots are matted

together, and creep over the bottom of rock-pools left at ebb tide, near low water mark. On the western shores of Ireland this plant is abundant, as far north as Galway. Rare on the English shores. Bill of Portland. Ilfracombe. Mount's Bay, and other places on the Cornish coast. Jersey.

FUCUS.

Name signifying sea-weed.

Root scutate. *Fronds* flat, compressed, or cylindrical; linear dichotomous (rarely pinnated), coriaceous. Air-vessels when present innate in the frond, simple, large. *Receptacles* terminal or lateral, pierced by many conspicuous pores.

FUCUS VESICULOSUS—BLADDER FUCUS, OR BLADDER WORT.

This is one of the very commonest sea-weeds, abundant on all rocky coasts. The fronds are

tough, with a midrib; the air-vessels are round, large, and mostly in pairs. When in fruit, the tips of the fronds swell up and are filled with mucus; those containing spores are of a greenish-olive colour, while the receptacles with antheridea are of a more or less orange-yellow hue. A curious bladderless variety of this plant β Balticus, is found in salt marshes and places only occasionally flooded by the tide. The fronds are narrow, and not more than two inches high, crowded together, and of a yellowish colour. Fucus vesiculosus is much used in the manufacture of kelp, and furnishes excellent winter provender for the cattle in the western islands of Scotland.

FUCUS CERANOIDES.—WAXY FUCUS.

A small and far more delicate species than the preceding, without air-vessels; the receptacles are borne by the side branches, not very large, forked and pointed at the ends. Colour a greenish or brownish olive: the substance is much thinner

than in the Bladder Fucus, and more transparent. Perennial. Spring and Summer. Grows on rocks and stones between tide-marks; land-locked bays and estuaries, and where fresh water flows into the sea, are its favourite growing places, but it is not entirely restricted to such localities. Not very common, though found in many places, from Orkney to Cornwall.

FUCUS SERRATUS.—SERRATED OR TOOTHED FUCUS.

Frond with a distinct midrib, divided, the margin regularly toothed; without air-vessels. Receptacles flat, swelling up in the tips of the fronds, and either containing (on different plants) roundish spores or antheridia; when the latter, a thickened, orange-coloured liquid exudes through the pores in drying; a drop of which, if placed under the microscope and wetted with salt water, will disclose countless numbers of zoospores, or

animated seeds, issuing forth with life-like activity, swimming in varied intricate circles, exactly re-rembling the movements of the smaller animalcules. Colour dark olive-green. Substance of the frond, leathery. Very common on rocky coasts.

FUCUS NODUSUS.—KNOTTED FUCUS. "SEA WHISTLES."

Fronds long, narrow; air-vessels large, swelling up in the main stem and branches. Receptacles stalked, lateral, springing from the marginal teeth on each side the frond, and when ripe of a rich yellowish orange colour. Substance very tough and leathery. Colour olive-green. This species grows from two to four or six feet in length; the breadth of the frond varies from a quarter to half an inch, or more. Perennial. Winter and Spring. Grows in dense masses on rocks and large stones between tide-marks. Very common.

FUCUS MACKAII.—MACKAY'S FUCUS.

"Frond six to ten inches long, densely tufted; branches crowded, spreading, compressed at base, cylindrical upwards. Air-vessels wider than the frond. Substance leathery; when dry, somewhat horny." Receptacles drooping, borne at the base of the branches. Colour dull olive-green. This species vegetates, unattached by any root, in land-locked bays, among boulders, and on muddy sea-shores. Perennial. April and May. West of Ireland, Cunnemara. North and west of Scotland; Loch Seaforth, Arasaig, Loch Coul and Kyle, Sutherlandshire. East coast of Skye, and head of Loch Duich.

FUCUS CANALICULATUS.—GROOVED, OR CHANNELLED FUCUS.

Without air-vessels. Receptacles swollen, terminal, divided into two, or in pairs. Smaller than the other species, from three to six inches in

length; one side of the stem is convex, the other grooved. Colour an olive-brown. Grows in thick tufts, on the surface of rocks near high-water mark. Perennial. Summer and Autumn. Very common.

HIMANTHALIA.

Name, a translation of the English name, "sea-thongs."

Frond top-shaped. *Receptacles* long, compressed, repeatedly forked, springing from the centre of the frond, pierced by pores.

HIMANTHALIA LOREA.—SEA THONGS.

Fronds round, small, fixed to the rocks by a most tenacious gluten. The part called a receptacle in this plant is long, narrow, and regularly forked; the cup-shaped frond, according to Dr. Harvey, is biennial, and takes a whole year to arrive at perfection; the strap-shaped receptacle does not appear before the second year, when it

rapidly attains its full size, matures its fruit, and falls off at the end of the season. Winter and Spring. Common on rocky shores. The receptacles are from two to ten feet long, and of a dark olive-green colour.

SPOROCHNACEÆ.—SPOROCHNUS TRIBE.

Inarticulate sea-weeds, much branched, with slender filiform or flattened branches, which are mostly furnished at some period of their growth with deciduous conferva-like tufts of light green filaments. Fructification spores attached to external jointed filaments, which are either free or compacted together into knob-like masses.

The species of this tribe while growing are of a bright olive colour, but on exposure to the air, they soon become flaccid, and rapidly change to a verdigris green hue, when they manifest the peculiar property of quickly decomposing other delicate algæ with which they may come in

contact; another peculiar feature common to many of the species, is that of the fresh specimens rendering the paper on which they are spread transparent for the time, as if touched with oil. The antheridia in this tribe are unknown, owing to the different arrangement of the spores in the genera of the Arthrocladia, it has been deemed requisite to divide the tribe into two families; in the first, the spores are borne on slender filaments springing from all parts of the branches; the species of Desmarestia while young are furnished with conferva-like filaments, but no fructification has ever been discovered on these plants. In the second family, the spores are produced in *capitula*, or knob-like receptacles; but of the twenty-four species known, only six are included in our Flora, and none of these are common except the Desmarestia. Desmarestia ligulata is an elegant plant when young, and Arthroclodia villosa is a beautiful plant, of a pale yellow-green, but not of frequent occurrence on our shores.

GENERA OF THE SPOROCHNUS TRIBE.

Family 1 of the Arthrocladia,

With their spores attached to slender filaments.

Desmarestia. Frond solid, either filiform or flat, distichously branched.

Arthrocladia. Frond cylindrical, furnished with whorls of small, slender, jointed filaments.

Family 2 of the Sporochnus.

With their spores produced in knob-like receptacles.

Sporochnus. Receptacles lateral, on short stalks.

Carpomitra. Receptacles terminal at the tips of the branches.

DESMARESTIA.

Named in honour of A. G. Desmarest, a celebrated French Naturalist.

Frond linear, either filiform, flat, or compressed; when young furnished with soft green filaments. *Fructification* unknown.

DESMARESTIA LIGULATA. — STRAP-LEAVED DESMARESTIA.

Fronds from two to six feet long, repeatedly pinnate. Pinnules lance-shaped, with spine-like teeth. Main frond with an obscure midrib, variable in breadth, set all along its length with opposite branches, which are either branched in the same manner, or simple and leaf-like. The young plants, as remarked by Withering, look much like the feathered part of a large quill. Colour, while growing, olive-brown, fading in the air to a verdigris green; yellowish when dry. Grows in pools between tide-marks, generally near low water mark. Annual. Summer. Frequent on the southern shores of England, and the south and west of Ireland. Jersey. Coast of Northumberland. Frith of Forth, about New Haven, and other places. Orkney Islands.

DESMARESTIA ACULEATA.—SPINY DESMARESTIA.

Fronds narrower than in the preceding species, from one to three feet long. The branches when young clothed with soft silky fibres, which have the appearance, at first sight, of a parasitical conferva. When the plant has done growing, these fibres fall off, and the branches bear short, spine-like ramuli. Substance rather rigid, not adhering to paper when old. Colour yellowish or dark green. Grows on rocks, stones, or algæ between tide-marks; also in four or five fathom water. Perennial. Frequent on most shores.

DESMARESTIA VIRIDIS.—GREEN DESMARESTIA.

Fronds filiform; main frond from two to three feet in length, much branched in a pinnate manner; branches and ramuli exactly opposite, each series

becoming more and more slender and attenuated, the whole plant having a strikingly feathery and delicate appearance. The colour while growing is a rich orange, tinted with brown; but as in others of the tribe, a few minutes' exposure to the air suffices to turn it to a light verdigris green. Substance at first rigid, but soon becoming flaccid. Grows on stones, and the larger algæ between tide-marks. Annual. Summer. Not uncommon on the British shores.

ARTHROCLADIA.

Name meaning a joint and a branch, in allusion to the nodose, or joint-like knots of the fronds.

Frond filiform, cylindrical, minutely nodose, with whorls of delicate, articulated filaments arising from the knobs. *Fructification.* Jointed pods springing from the filaments.

ARTHROCLADIA VILLOSA. — FIBROUS ARTHROCLADIA.

Fronds very slender, from six inches to nearly three feet long; pinnated with opposite, very seldom alternate, simple or again pinnated branchlets, which are furnished at regular intervals with small joint-like swellings, set round with delicate jointed conferva-like filaments of a pale green colour; the lanceolate spore-pods are borne on these fibres. Grows attached to various substances in four to five fathom water. Annual. Summer and Autumn. Rare. Coast of England; several localities, chiefly on the southern shores. Yarmouth. Sidmouth. Torbay. Minehead, Somerset, thrown up from deep water, but very rarely. I. G. Anglesea. Jersey. At Wicklow, Malahide, and Carrickfergus, in Ireland. Frith of Forth. Ardthur.

SPOROCHNUS.

Name a *seed*, and *wool*, because tufts of fibres accompany the fructification.

Frond filiform, solid. *Fructification* lateral, crested, stalked receptacles, terminated by a slender tuft of deciduous filaments.

SPOROCHNUS PEDUNCULATUS. — SLENDER SPOROCHNUS.

"*Stem* from six to eighteen inches long, filiform, quite simple, set throughout its length with long, slender patent, mostly alternate branches. Colour yellowish, and semi-transparent." Grows in deep water, and near low mark. Annual. Summer. Eastern and southern shores of England; not uncommon. Falmouth, very rarely, Miss Warren. Anglesea. Jersey. Killiney, Dublin Bay. Belfast Bay. Malahide. Bantry Bay, and Roundstone Bay. Cunnemara, Ireland. At Preston Pans, Frith of Forth, Scotland.

CARPOMITRA.

Name *fruit*, and a *mitre*, in allusion to the shape of the fruit.

Frond filiform, or flat midribbed, sub-dichotomous. *Fructification.* Mitre-form receptacles, terminating the ends of the branches.

CARPOMITRA CABREÆ.—CABRERA'S CARPOMITRA.

Fronds narrow, flat, irregularly forked, occasionally constricted destitute of nerve, except at the base, where there is an obscure midrib. The root is a small shapeless woolly tuber. In colour it resembles that of Desmarestia aculeata, and, according to Dr. Harvey, some very narrow varieties of Dictyota dichotoma are the only species of British sea-weed that can at all be confounded with it; but a slight examination is sufficient to show the difference. This rare species has only hitherto been found at Youghal, on the south coast of

Ireland, and in Plymouth Sound; it is likewise a native of the south of Spain and New Zealand; but is of rare occurrence in all these widely separated localities.

LAMINARIACEÆ.—LAMINARIA TRIBE.

Sea plants of an olive-green or olive-brown colour, of a membranaceous or leathery texture. *Fronds* large, leaf-like, stalked, and cleft, or tubular and divided internally by partitions arising at equal distances. *Fructification.* Spores either forming *indefinite* patches on some part of the fronds, or covering the whole surface.

The large species of Alaria and Laminaria which grow in deep water along our shores, are very different from all other sea-weeds; they may at once be known by their round woody stems and long flat fronds. In Alaria the stem is percurrent through the main frond, forming a distinct mid-rib. The fructification in this genus is confined

to the narrow, veinless leaflets which arise from the stem, while in Laminaria it is generally dispersed over the fronds in cloud-like patches; the spores are very minute, taken in connection with the large size of these plants, and they can only be detected in old plants, full grown, consequently specimens in fruit cannot be entered in the Herbarium from their unwieldy size; small portions of such it is, however, well to preserve when in fruit, for the sake of comparison. Young plants of the large growing kinds, as Laminaria digitata, may be found at an early stage, exhibiting the peculiarities of their growth, and well suited for collections. The perennial species are found to change their fronds yearly; the young frond arises at the base of the old frond, gradually enlarges, and by degrees pushes it off: this change is not confined to old plants, but takes place in those of all ages. Small specimens of L. saccharina, and L. Phyllitis, when perfect, and well preserved, so as to exhibit the delicate foldings of their fronds, their soft, pale green colour, and

elegant forms, make them well-deserved favourites with all who have an artist's eye, and are admirers of nature's works. Who would think "the rough, rude sea" contained such soft and spring-like leaves! In outward appearance, the plants of the next genus (Chorda), have little in common with the others of this tribe; but the fructification of Chorda filum agrees with that of the Laminariaceæ, and, accordingly, this genus has been removed from Dictyotaceæ, in which it was formerly included: in old plants, the whole frond becomes covered with spores, like the majority of the Laminarian tribe. Chorda filum flourishes most luxuriantly in deep water; and in the still water of quiet bays it forms extensive, submerged meadows, so dense as to be dangerous to the unwary swimmer who may venture among its slimy and tenacious cords. Such is the strength of these cords, that the Highlanders are said to employ them for fishing-lines, and give them the name of "Lucky Minny's Lines;" in England they are known as "Sea-Traces," or "Sea-

Laces." The "Tangles" (Laminarias) are highly prized for manuring their potatoes with by the poor on the western coast of Ireland. "Every creel of that is a ridge of *pweatties,* with the blessing of God upon it," was the remark of a poor Irishman to an observant traveller. In the deep but clear water which surrounds that and other open rocky coasts, the *Tangles* can be descried far below the surface, forming miniature groves of luxuriant growth, their long and leafy fronds waving to and fro in the transparent medium, peopled by strange creatures of the deep, and invested with the feather-like tufts of the lesser and filiform algæ, reveal to the observer their importance in the economy of animal and vegetable life inhabiting our shores. In the seas of the southern hemisphere, on the shores of Australia and New Zealand, the lesser forms of our Laminariaceæ are represented by gigantic species belonging to the allied genera of Lessonia, Durvilleæ, Macrocystis, and Nereocystis. Several species of the former are particularly abundant in the seas near

the Falkland Isles and Cape Horn. One gigantic species of Lessonia, described by Dr. J. W. Hooker, rises with a huge stem eight or ten feet in height; the ends of the branches give out leaves two or three feet long and barely three inches broad, which, when in the water, hang down like the boughs of a willow. "No person," he says, "who has not actually seen it can form an idea of the amount of life which is nourished and housed by one of these tree-seaweeds." In length, all other species of the tribe are surpassed by the Macrocystis, a species ranging along the American shores of the Pacific from the Arctic to the Antarctic ocean. The stem is said to attain the astonishing length of 1,500 feet: as it approaches the surface, the stem branches, and afterwards divides by repeated forkings, until there results a floating mass of foliage some hundreds of square yards in superficial extent.

GENERA OF THE LAMINARIA TRIBE.

Alaria. Leaf with a distinct midrib.

Laminaria. Frond without a midrib.

Chorda. Frond cylindrical, unbranched, hollow, and constricted at intervals.

ALARIA.

Name from *Ala, a wing,* in allusion to the winged leaflets at the base of the frond.

"*Frond* membranaceous, furnished with a percurrent midrib, the stem pinnated with distinct ribless leaflets. *Fructification* pear-shaped, *spores* vertically arranged in the thickened leaflets."—*Greville.*

ALARIA ESCULENTA—EDIBLE ALARIA. "DABERLOCKS."

Stem thick, winged at the base with flat, sword-shaped, nerveless leaflets. *Frond* very long, penetrated throughout its whole length by the stem, which is visible on both its surfaces, the margin "wonderfully plaited and curled." Dr. Greville

says:—"The midrib, stripped of the membrane, and sometimes the leaflets, are eaten in Ireland, Scotland, Iceland, Denmark, and the Faroe Islands. It is called in Scotland, Badderlocks, or Henware, and in the Orkney Islands, Honeyware. Dr. Drummond informs me that, in some parts of Ireland, it bears the name of Murlins." Grows on precipitous rocks at low-water mark. Perennial. Winter and Spring. Abundant on the shores of Scotland, at the Orkneys, the north of Ireland, and on the coasts of Northumberland, Durham, Cumberland. Isle of Man. Anglesea. Dorset. North coast of Devon. The Land's End, and north coast of Cornwall.

LAMINARIA.

Name from *lamina*, *a thin plate*, in allusion to the flat fronds of the species.

Frond stalked, coriaceous or membranaceous, flat, undivided, or irregularly cleft, ribless. *Fructification* cloudy, spots of spores imbedded in some part of the thickened surface of the frond.

LAMINARIA DIGITATA — FINGER-CLEFT LAMINARIA, OR "SEA GIRDLES AND HANGERS."

Stem thick, solid, and woody. It tapers a little at top, then suddenly expands into a frond of a foot or more in breadth, which is again divided into a number of strap-shaped segments. Root large and fibrous, adheres to rocks and stones in deep water. This plant, when taken out of the water, and held by the stem, has been said to resemble a flag-staff and flag, the latter cut horizontally into strips. The colour is an olive-green, and the substance of the fronds is tough and leathery. The var. *Stenophylla*, pl. 338 Phyc. Brit., known under the name of "*Cuvy*" in the Orkneys, appears a well-marked variety. "Whole plant dark brown; stipes slender, flaccid, glossy, becoming compressed or flattened upwards; lamina wedge-shaped and tapering at base, much longer than the stipe; digitate, its segments few, and very narrow." Under

the rural name of "*Cows' Tails*," L. digitata is often hung up in the cottages and poorer farm-houses in England, where it serves the purpose of a natural hygrometer.

LAMINARIA BULBOSA—BULBOUS-ROOTED LAMINARIA, OR GREAT FURBELOWED LAMINARIA.

Frond long, narrow, undivided when young, but when full grown leathery, thick, and cleft into many narrow segments; the root is large, hollow, and tuberous, thickly set with protuberances; from the base proceed strong fibres, which fix and secure the plant in its growing place. Young plants are at first unprovided with this support; it shows itself in the middle of th young stem like a small enlargement or collar, which enlarges gradually, becoming broader and quite flat, eventually forming a hollow-shaped tuber, as described above. The fronds are very

LAMINARIA SACCHARINA

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long, when full grown; in some plants fifteen feet in length. Colour olive green, with a glossy appearance, as if varnished; substance of the frond more tender than in Laminaria digitata. Grows in deep water and on rocks at low-water mark. Perennial. Autumn.

LAMINARIA SACCHARINA—SWEET LAMINARIA—SEA-BELT.

Stem cylindrical, filiform, slender. Frond undivided. Margin waved. Substance variable; in young specimens thin and delicate, in others tough and leathery. Colour olive green, or yellowish green. The fronds are from two to twelve feet in length, and from four to sixteen inches wide. In the variety β *latifolia*, the fronds are very broad, and the substance is more membranaceous than in the ordinary form. This variety grows in deep water in sheltered bays.

LAMINARIA LONGICRURIS.—LONG-STEMMED LAMINARIA.

A species with a simple frond and very long stem, in many respects resembling L. saccharina, but easily distinguished by the stem becoming hollow and decreasing in diameter upwards. A battered plant was picked up by Dr. W. H. Harvey, at the Giant's Causeway, and another has been found drifted ashore at Ardrossan, Ayrshire, by Dr. Landsborough. This species abounds throughout the Northern Ocean. Phy. Brit. Pl. 339.

LAMINARIA PHYLLITIS.—HARTS'-TONGUE LAMINARIA.

Not uncommon, and nearly resembles the last species, of which it is probably only a variety. Dr. Harvey remarks:—"The more lanceolate form, delicate substance, and pale yellowish green colour, constitute the chief marks of distinction." Grows

on stones or on the stems of the larger algæ, and in deep water. Summer. Portland Head. Sidmouth. Yarmouth. Dover. Coasts of Sussex and Dorset. Torbay. Tenby. On the Irish coasts at Larne, near Belfast. Howth. Kingstown. Balbriggan. Western Islands of Scotland. Staffa. Ardrossan. Frith of Forth. Orkney Islands.

LAMINARIA FASCIA.—SMALL TUFTED LAMINARIA.

Stem very short; fronds either broadly oblong, wedge-shaped, or lanceolate, from four to twelve inches long, of a delicate membranaceous substance and olive-yellow hue. Grows on sand-covered rocks and stones near low water-mark. Annual. Summer. North of Ireland. Larne. Antrim Coast. Carrickfergus. Malahide. Western Islands of Scotland, and Saltcoats, Ayrshire. On the English shores at Sidmouth, Torbay, Plymouth, Falmouth, St. Michael's Mount, plentiful. The

broad-fronded form of this plant was formerly described as a distinct species, under the name of *L. debilis.*

CHORDA.

Name *chorda, a cord.*

Frond simple, filiform, cylindrical, internally hollow, and divided into separate compartments by transverse partitions. *Root* scutate. *Fructification* external, continuous masses of pear-shaped seeds attached at their base.

CHORDA FILUM.—STRING-LIKE CHORDA. "SEA-LACES."

Fronds from one to twenty feet long, horny, without external constrictions, dark olive-brown, shiny, covered with pellucid hair-like filaments, tapered at both ends. The fructification covers

the surface of old plants, the spores are fixed to the outer stratum of cellular tissue by long pedicels. At ebb-tide this plant may be observed in great masses, the long cord-like fronds floating just below the surface of the water. In land-locked bays and harbours, such as Falmouth and Milford, this plant luxuriates and often grows to thirty or forty feet in length. The small variety *β. tomentosa* grows between tide-marks, and is generally characterized by a more dense covering of long olive or green-coloured hairs. By some authors it is reckoned a distinct species, but Dr. Harvey does not consider these characters sufficiently well-marked to allow of its being separated from the common form. Grows on rocks and stones in the sea, above the level of low water-mark, and in still water at the depth of ten or fifteen fathoms. Annual. Summer.

CHORDA LOMENTARIA.—CONSTRICTED CHORDA.

Fronds constricted at intervals, as if tied; slightly inflated in the part between each of the contractions. From three to sixteen inches in length, not half an inch in breadth; narrower at each end. Substance soft and flaccid. Colour brownish or yellowish olive. Grows on rocks and stones between high and low water-marks. Annual. Summer and Autumn. Not uncommon.

DICTYOTACEÆ.—DICTYOTA TRIBE.

Marine plants of an olive-green or olive-brown colour and membranaceous substance, rarely coriaceous or cartilaginous, and scarcely at all juicy, with a highly reticulated structure. *Fronds* various in form, round or flat, simple or branched, without nerves or veins (excepting Haliseris), often divided in a fan-like shape. *Fructification.* Spores

grouped together on the surface of the fronds into distinct spots or lines.

The reticulated or net-like structure of the fronds, and peculiar disposition of the spores, readily distinguish these plants from the foregoing tribe. Some of the species are of great beauty and rarity. Padina Pavonia is only found on the south coast of England, this is its northernmost limit; throughout the tropics, and along the shores of Southern Europe, it is an abundant species. The shape of the frond, and the markings on the surface, causes the plant when dry to resemble very much the common fungus, *Polyporus versicolor*. When growing it is very beautiful, and the fronds are clothed, as are many others of the tribe, with very fine hairs, which often decompose the rays of light, reflecting prismatic colours. Haliseris Polypodiodes is the only species furnished with a midrib; it is an elegant plant of a pale yellow colour, and when recent emitting a remarkable scent; after drying this is not observable. Twelve genera are included in the

Dictyota tribe; in the first six the root is coated with woolly fibres; in the others it is a small naked disk.

GENERA OF THE DICTYOTA TRIBE.

Cutleria. Frond ribless, irregularly cleft. *Sori* dot-like, scattered.

Haliseris. Frond forked, with a midrib.

Padina. Frond fan-shaped. *Sori* linear.

Zonaria. Frond lobed. *Sori* roundish.

Taonia. Frond irregularly cleft; somewhat fan-shaped. *Sori* linear.

Dictyota. Frond linear, forked. *Sori* roundish.

Stilophora. Fronds cylindrical. *Spores* forming a wart-like *sori.*

Dictyosiphon. Fronds tubular. *Spores* irregularly scattered, solitary, or in dot-like *sori.*

Striaria. Spores in *sori,* arranged across the frond in lines.

Punctaria. Frond flat leaf-like. *Spores* in small distinct dots.

Asperococcus. Frond tubular, cylindrical, or compressed. *Spores* in dot-like *sori*.

Litosiphon. Frond cartilaginous, filiform. *Spores* scattered.

CUTLERIA.

Named in honour of Miss Cutler, a distinguished British algologist.

Frond flat or compressed, irregularly cleft, somewhat fan-shaped. *Fructification.* Dotted tufts of spores scattered over the surface of both sides of the frond.

CUTLERIA MULTIFIDA.—MANY-TIPPED CUTLERIA.

Frond thickish, of an olivaceous or rusty hue, from two to eight inches long, divided in an irregular manner into rather narrow segments, which are again cleft in a similar way, and finally are elongated and repeatedly split at the extremities.

The fructification appears scattered over the whole surface in small prominent dots; the young plants are often fringed with minute fibres. Substance at first crisp, but becomes flaccid, and adheres well to paper in drying. Grows on rocks and shells at a depth of from four to fifteen fathom water. Annual. Summer and Autumn. Yarmouth, Brighton, Seaton, Sidmouth, Torquay, and Plymouth, on the English coast. At Roundstone Bay, Cunnemara, Kilkee, Bantry Bay, Ballycotton, Co. Cork, and Wicklow, on the Irish shores. Very rare in Scotland. Orkney.

HALISERIS.

Name signifying sea endive.

"*Root* a mass of woolly filaments. *Frond* flat, linear, membranaceous, with a midrib. *Fructification.* Oval *spores,* forming distinct *sori* or groups, mostly arranged in longitudinal lines."—*Grev.*

HALISERIS POLYPODIOIDES.—ENTIRE-LEAVED HALISERIS.

Fronds from four to twelve inches high, repeatedly forked and furnished with a strong midrib; the margin always entire. The spores occur in lines on each side the midrib, or dispersed in small spots over the face of the frond. Colour a brownish or yellowish olive. Substance delicate and membranaceous, not adhering well to paper in drying. The smell of this is very pungent and disagreeable when first gathered. Grows on rocks and stones in tide-pools, and in from four to five fathom water. Biennial. Several stations on the south coast of England.

PADINA.

Name invented by Adanson, who has not explained its meaning.

Root coated with woolly fibres. *Frond* flat, fan-shaped, marked at regular distances with concentric

lines, fringed with articulated filaments; the margin of the frond rolled back.

Fructification. Linear concentric *sori* bursting through the upper surface of the frond.

PADINA PAVONIA.—PEACOCK'S-TAIL PADINA.

Fronds tufted two to five inches high, stalked or sessile, erect, broadly fan-shaped, either entire or repeatedly and deeply cleft, all the divisions being fan-shaped. The upper surface of the frond is marked with regular bands, along which the spores are placed in linear sori. The under part of the frond is frequently covered with a whitish powdery substance, and the texture of this portion of the plant is leathery and thickened, while the upper surface is delicately membranaceous and transparent. Grows on rocks in shallow tide-pools, at half-tide level-race.

Torquay and other places along the south and west of England. Dr. Harvey, in his interesting little work, the "Seaside Book," says:—"This charming plant is only known with us on the south coast of England, where it occurs in many places; but it is one of the commonest shore plants of the tropical sea, and also fringes the margin of the Mediterranean. It is an annual, appearing with the early summer, and fading before the autumn sets in. When growing, its fan-shaped fronds are rolled up into cups, while the delicate fibres with which they are bordered, and which form concentric bands on their surface, decompose the rays of light, and reflect the most beautiful glaucous and prismatic tints."

ZONARIA.

Named from a *zone* or *girdle*.

Roots coated with woolly fibres. Frond flat, fan-shaped, entire or variously cleft, marked with

concentric lines, the cells of the surface radiating. Fructification roundish or irregular, scattered sori bursting through both surfaces of the frond.

ZONARIA PARVULA.—SMALL ZONARIA.

Fronds procumbent, of an olivaceous green colour, one to several inches in diameter, spreading over the rocks in patches, and attached by whitish fibres, except at the margins, which are full and lobed; the lobes are rounded, smooth, entire, and often imbricated. Substance membranaceous, somewhat transparent, and highly reticulated; the cells are four-sided. On British plants the fructification has not been observed, but it is described on Swedish specimens by Dr. Areschoug. Grows attached to rocks and corallines between tide-marks, and in four to fifteen fathom water. Annual. Spring and Summer. Found all round the coast.

ZONARIA COLLARIS.—CUP-SHAPED ZONARIA.

Primary frond, when mature, leathery in colour and substance, widely spreading, furnished on its lower surface with a dense woolly coating, by which it adheres firmly to rocks; the upper surface is smooth, variously plaited; but by the action of the waves, &c., becomes very much torn and lobed. From this frond arise secondary cup-shaped ones, fixed by short stalks, delicately membranaceous in texture, and easily torn. Fruit unknown. The *secondary* fronds of this plant were found by Miss Turner, washed ashore, quite fresh, in Grouville Bay, Jersey, May, 1851. "Very rare." "The firmly attached primaries may possibly be reached by dredging on the coast."—Phyc. Brit. Pl. 359.

TAONIA.

Name meaning a peacock.

Frond flat, imperfectly fan-shaped, irregularly

cleft, highly reticulated, marked with concentric lines. *Fructification.* Linear, wavy, concentric, superficial sori, on both surfaces of the frond.

TAONIA ATOMARIA.—BANDED TAONIA.

A beautiful plant of a brownish olive colour, the fronds of which are variously cleft, and marked with very conspicuous transverse bands of seeds. In length, the fronds are from three to twelve inches, the segments mostly wedge-shaped, and blunt at their tips. Grows on rocks between tide-marks. Annual. Summer. Rare. East and south of England. Cromer. Corton and Gunton, Norfolk. Coasts of Sussex and Devon. Occasionally cast ashore on the beach at Minehead, Somerset, I. G. Worm's Head, Glamorganshire. Ballycotton, Co. Cork. Frith of Forth.

DICTYOTA.

Name signifying a *net*; from the reticulated structure of the frond.

Frond flat, membranaceous, reticulate, dichotomous, or pinnatified. *Fructification.* Spores either scattered over both surfaces of the frond, or on distinct plants collected into dense spots.

DICTYOTA DICHOTOMA.—CLEFT DICTYOTA.

Fronds regularly cleft, tapering gradually to the end. Colour, a pale yellowish or olive green. Substance membranaceous, adhering to paper, which it often contracts in drying; this arises from the shrinking of the fronds, and can scarcely be avoided. When the paper is much drawn up, a narrow slip may be cut out, the edges of the paper drawn together and gummed. This will make the specimen lay flat, and allow of its being

fixed in the herbarium. Grows on rocks and algæ between tide-marks, and in a depth of from four to fifteen fathom water. The variety β *intricata*, with very narrow and curiously-twisted fronds, is equally common as the above form on our shores. Annual. Summer.

STILOPHORA.

Name from a *dot* and *to bear* in allusion to the dot-like fructification.

Frond filiform, solid, or tubular, branched. *Fructification.* Convex, wart-like *sori*, scattered over the surface, composed of obovate *spores*.

STILOPHORA RHIZODES.—ROUGH STILOPHORA.

Fronds slender, filiform, from six to twelve inches long, repeatedly branched, and pretty regularly forked or branched in an alternate manner.

The branches have a beaded appearance from the abundance of the wart-like fructification which clothes their surface. Colour, a yellow or olive brown. Substance cartilaginous, but dissolving into jelly if left in fresh water for any time. Grows on rocks and algæ near low-water mark. Annual. Summer. Frequent on the shores of England and Ireland. Jersey.

STILOPHORA LYNGBYEI.—LYNGBYE'S STILOPHORA.

Fronds at first tubular, afterwards distended, from two to four feet in length; branches forked, spreading with rounded axils tapering towards the tips. Spots of spores arranged in transverse lines. When first taken out of the water, the substance is crisp and fragile, but soon becomes soft, and then adheres firmly to paper in drying. Colour an olive brown or foxy hue, greenish olive when dry. Grows in four to ten fathom water.

Annual. Summer. Land-locked bays on the coasts of Scotland and Ireland. Abundant in many places. Falmouth Harbour, Cornwall.

DICTYOSIPHON.

Name signifying a *net* and a *tube*, in allusion to the structure.

Frond filiform, tubular, branched. Outer cells small, inner ones elongated, connected into filaments. *Fructification.* Spores scattered over the surface, either in groups or singly.

DICTYOSIPHON FŒNICULACEA.—FENNEL-LIKE DICTYOSIPHON.

Fronds slender, filiform, from one to many fee in length. Of a yellowish olive or brown colour, arising from the main stem in an alternate manner; from these again proceed a second and third series, each more slender than the last, and all at the

extremity. Fructification rare. Grows between tide-marks, on stones, or parasitic on other algæ. Annual. Spring and Summer. Found all round the coast.

STRIARIA.

Named from the transverse *striæ* formed by the fructification.

"*Frond* filiform, tubular, continuous, membranaceous, branched. *Fructification.* Groups of *spores* forming transparent lines."—*Grev.*

STRIARIA ATTENUATA.—SLENDER STRIARIA.

Fronds tufted, from three to twelve inches high, set with many lengthened, spreading, simple, or nearly so, opposite branches, much narrowed off at their insertion, and at the tips. Sometimes a second series of such branches is produced; in the Devon plants they arise in whorls of three,

four, or five together. When in fruit, the branches are marked across with bands composed of clusters of spores. The substance is delicately membranaceous. The colour pale olive. Grows between tide-marks, and in four to five fathom water on other algæ. Annual. Summer. Rare. Devonport. Falmouth. Penzance. Ilfracombe. Roundstone-bay, Connemara.

PUNCTARIA.

Name from *punctum* a *dot*, descriptive of the dotted fructifications.

Frond simple, membranaceous, with a naked scutate root. *Fructification* scattered over the whole frond in minute distinct spots.

PUNCTARIA LATIFOLIA.—BROAD-LEAFED PUNCTARIA.

Fronds of a pale olive-green colour, and delicate substance; oblong or obovate in shape, usually

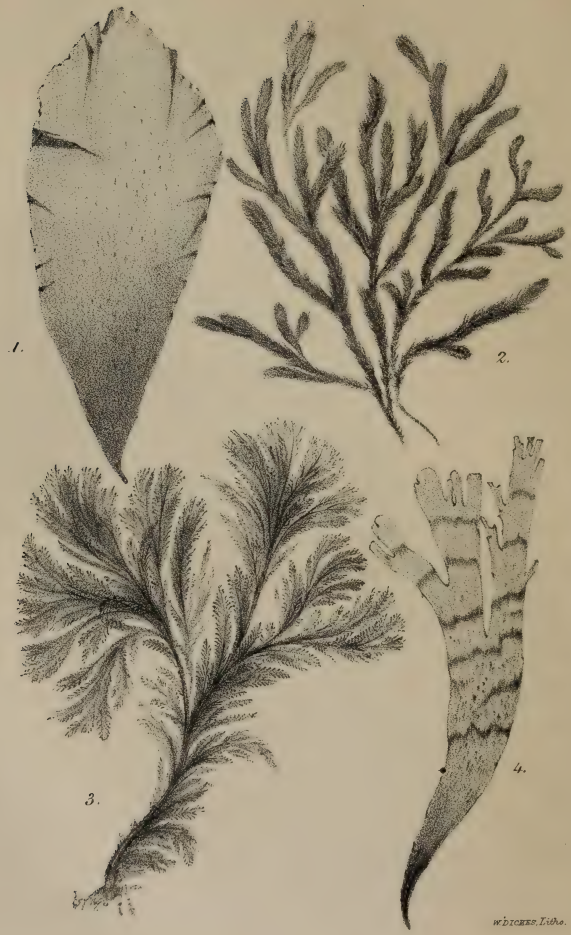


Fig 1. PUNCTARIA PLANTACINEA. *Fig 3. SPHACELARIA SCOPARIA.*

„ 2. CLADOSTEPHUS SPONCIOSUS. *„ 4. TAONIA ATOMARIA.*

obtuse at both ends. Fructification minute, looking like small grains of sand scattered over the fronds. Grows on rocks and algæ between tide-marks. Annual. Spring and Summer. Sidmouth. Torquay. Falmouth, very rarely, Miss Warren, Minehead, Somerset, very rare, I. G. West of Ireland, frequent. Near Belfast. Isle of Islay.

PUNCTARIA PLANTAGINEA.—PLANTAIN-LEAVED PUNCTARIA.

Fronds of a dull olive-brown colour, and rather tough; substance, obovate in shape, and much tapered at the base. "*Dots* of fructification oblong, larger than in the preceding species, from which this character, with the thicker substance and darker colour, serve to distinguish it." Not uncommon attached to rocks and some of the larger algæ between the tidal levels. Annual. Summer. Various places on the coasts of England, Ireland, and Scotland.

PUNCTARIA TERMISSIMA.—SLENDER PUNCTARIA.

Fronds delicate, always tapering at the base, and the margin more or less toothed. Fruit unknown. Mrs. Griffiths considers this the young of P. latifolia. Grows on Zostera Marina, &c. Annual. Summer. Bute and Appin in Scotland, and near Dublin.

ASPEROCOCCUS.

Name signifying *rough seed*.

Frond unbranched, tubular, cylindrical, or (rarely) compressed, continuous, membranaceous. *Root* minutely scutate, naked. *Fructification.* Small distinct spots (sori) composed of spores mixed with erect club-shaped filaments.

ASPEROCOCCUS COMPRESSUS.—FLATTENED ASPEROCOCCUS.

Fronds from six to eighteen inches long, of an olive or yellow-green colour, narrow, tapering near the base into a small stem. Fructification, large oblong dots, covering both surfaces of the frond. Thrown up from deep water. Rare. Annual. Summer. Southern coast of England. Sidmouth. Torquay. Falmouth Harbour, "very rarely," Miss Warren. Long Rock, in Mount's Bay, near Penzance.

ASPEROCOCCUS TURNERI.—TURNER'S ASPEROCOCCUS.

Fronds large, from eight inches to as much as six feet in length, and from half an inch to six inches in diameter, of a pale yellow-green colour, inflated at intervals and then contracted. Fructification densely scattered over the frond in very

small spots. Grows on stones and the larger algæ between the tidal levels, and in four to fifteen fathom water in muddy bays. Annual. Summer. Found all round the coast.

ASPEROCOCCUS ECHINATUS.—ROUGH ASPEROCOCCUS.

Fronds many, growing from the same base, varying from two inches to twenty feet in length; seldom more than half an inch in diameter, gradually and very much attenuated at the base. Fructification appears in rough minute crowded dots on the surface; young fronds are clothed with long, pellucid fibres. Colour olive-brown, greenish when young. Substance soft; adheres firmly to paper. The variety β *vermicularis* has very slender and much-twisted fronds; it usually grows on other small algæ, whereas the wide variety occurs on stones, &c., between tide-marks. Annual. Summer and Autumn. Common on the British shores.

LITOSIPHON.

Name meaning a slender tube.

Frond unbranched, cylindrical, filiform, cartilaginous, sub-solid; at length tubular; composed of several rows of cells; the surface areolated.

Fructification. *Spores* either singly, or four or more together, scattered irregularly over the surface of the frond.

LITOSIPHON PUSILLUS.—SILKY LITOSIPHON.

Fronds two or six inches high, parasitical on *Chorda filum*, often so closely set on the frond of that plant as to give it the appearance of a bottle brush. Spores round, prominent, scattered, or one or two together. Annual. Summer.

LITOSIPHON LAMINARIÆ.—THE ALARIA LITOSIPHON.

Grows on tufts of a quarter to half an inch in height upon the leafy portion of *Alaria esculenta*. Fronds marked by transverse bands placed near each other; *spores* four or more in each band. Colour, a dull olive brown. Annual. Summer.

CHORDARIACEÆ.—CHORDARIA TRIBE.

Sea plants of an olive colour, with a gelatinous or (rarely) cartilaginous frond, composed of articulated filaments interlaced together. *Spores* attached to the filaments, concealed within the substance of the frond.

In *form* the fronds of these plants differ widely from each other; the loosely gelatinous structure is clearly shown in Mesogloia, and is less apparent in Ralfsia than in any of the genera. Ralfsia deuster, the only species of this genus, is described

by Dr. Harvey:—"As a singular production, which, to the naked eye, more nearly resembles a crustaceous lichen than an alga, but its structure and fructification prove it to be widely different to any lichen." The Leathesiæ have tuber-shaped fronds, fleshy and hollow, in L. tuberiformis, while in L. Berkleyi they are soft and depressed. Often nearly of the colour of the rock on which it grows, this plant may be easily overlooked by the collector; at present it is only known in the south of England and west of Ireland. The various species of Elachista, and especially the Myrionema, require to be submitted to the microscope for a proper discrimination of the species. M. Lechlancherii, which may be found in autumn on the decaying fronds of Rhodymenia palmata, appears a beautiful kind when viewed through the glass; to the naked eye it is only apparent in the form of very small round olive spots on the fronds of R. palmata and Ulva latissima.

GENERA OF THE CHORDARIA TRIBE.

Chordaria. Frond, the central part *firmly* gelatinous.

Mesogloia. Frond, the centre of the frond *loosely* gelatinous.

Leathesia. Frond tuber-shaped.

Ralfsia. Frond crustaceous.

Elachista. Filaments pencilled rising from a tubercular base.

Myrionema. Filaments rising from a flat base. Minute.

CHORDARIA.

Name from *chorda* a cord.

Frond filiform, much branched, cartilaginous; the central structure consists of densely packed longitudinal filaments; the outer portion of simple, club-shaped whorled filaments, and gelatinous fibres. *Fructication spores* placed among the outer filaments.

CHORDARIA FLAGELLIFORMIS.—DROOPING CHORDARIA.

Fronds from three inches to three feet in length. With a central stem, which is either simple or divided in its upper part, and bears numerous, irregularly inserted side-branches, generally undivided. Colour, dark olive-green. Substance, firm and cartilaginous. "The whole frond, if viewed in water, appears fringed with exceedingly fine, colourless fibres, which give to the surface a slimy feel." Grows on rocks and stones between tide-marks. Common. Annual. Summer.

CHORDARIA DIVARICATA.—SPREADING CHORDARIA.

Fronds from one to three feet long, forming tufts, branches spreading in all directions, very irregularly divided, and often furnished with forked ramuli. Colour olive. "The branching is sufficiently unlike that of C. flagelliformis, resembling

much more closely that of Stilophora rhizodes, to which outwardly this plant bears a very great resemblance. Besides the difference in habit, it is well distinguished from C. flagelliformis by the shape of the filaments of the periphery, which in that species are club-shaped, while in this they are slender, but terminated by a large globular cellule. In this respect there is a resemblance to a Mesogloia, but the structure of the axis is exactly that of Chordaria." Phyc. Brit. Annual. Autumn. Thrown up from deep water at Carrickfergus, near Belfast. Mr. McCalla. October, 1845. Found floating in Falmouth Harbour, in June, 1850, by Mr. F. Pascoe.

MESOGLOIA.

Name meaning the *middle* and *viscid*, in allusion to the gelatinous centre.

Frond filiform, much branched, gelatinous; the central structure composed of interlacing, longi-

tudinal fibres, invested with gelatine; the outer of spreading, forked, coloured filaments. *Fructification,* spores attached to the forks of the outer filaments.

MESOGLOIA VERMICULARIS.
WORM-LIKE MESOGLOIA.

Fronds from one to two feet high, thick, worm-like, flaccid, and gelatinous, ramuli long, and many resembling the branches. Colour pale olive-green or yellow. *Spores* common, ovate in form. Grows on rocks and stones between tide-marks, common. Annual. Summer.

MESOGLOIA GRIFFITHSIANA.
GRIFFITHS' MESOGLOIA.

Fronds eight to sixteen inches high. Stem nearly simple, set throughout its length with long, slender, simple, alternate or opposite branches, "The surface covered with long colourless fibres,

similar to what occur in C. flagellifornis, which makes the plant, as it waves in the water, look of much greater diameter than it really is." *Spores* pear-shaped. Grows between tide-marks. Rare. Annual. Summer. South of England and West of Ireland. Sidmouth. Torquay. "Very rarely cast ashore in Falmouth Bay," Miss Warren. Bantry Bay.

MESOGLOIA VIRESCENS.—GREEN MESOGLOIA.

Fronds eight to twelve inches high, gelatinous, with long simple or forked branches, bearing alternate or second spreading ramuli. Colour olive-green. The fronds are clothed with colourless fibres, the same as in the above species. Annual. Summer. Not uncommon. Sidmouth. Torquay. Falmouth. Penzance. Bantry Bay. Appin, Argyleshire.

LEATHESIA.

Named in honour of the Rev. G. R. Leathes, a British Naturalist.

Frond globose or lobed, fleshy and cartilaginous, composed of jointed, colourless, forked filaments, their tips forming the fleshy coating of the frond, are coloured and tufted. *Fructification.* Spores attached to the coloured tips of the filaments.

LEATHESIA TUBERIFORMIS. — TUBER-SHAPED LEATHESIA.

Fronds fleshy, hollow tubers spreading over rocks, &c., between tide-marks abundantly; olive-brown in colour, and somewhat resembling the root of Laminaria bulbosa. Annual. Summer.

LEATHESIA BERKELEYI.—BERKELEY'S LEATHESIA.

Fronds dark brown, depressed, soft and fleshy,

one to two inches in diameter. "Resembling in its fleshy appearance the collapsed body of the common Actiniæ (Sea anemone.)" On sub-marine rocks, between tide-marks. Annual. Summer.

RALFSIA.

Named in honour of John Ralfs, Esq., of Penzance, the author of an excellent work on the British *Desmidieæ*, &c.

Frond leathery and crustaceous, adhering by its under-surface, spreading, zoned, composed of densely-packed filaments. *Fructification*, sunken warts over the surface, containg spores fixed at the base of upright filaments.

RALFSIA VERRUCOSA.—ROUGH RALFSIA.

"On rocks between tide-marks, common. Perennial. Winter. *Fronds* forming lichen-like patches on the surface of flat rocks, from one to six inches in diameter; when young, orbicular, but becoming

very irregular in outline when old. In young specimens the surface is nearly flat and even; but in full-grown plants is exceedingly rough, with wart-like prominences. *Structure* very dense and opaque. *Fruit* rare, and difficult to find. *Colour* a dark-brown. *Substance* leathery, hard."—*Harv. Man.*, p. 49.

ELACHISTA.

Name the *least*, from the small size of the plants.

Frond parasitical, consisting of a dense tuft of free, simple, articulated, oliveaceous filaments, rising from a base composed of fibres, closely combined together. *Fructification*, spores attached to the bases of the filaments forming the tubercle.

ELACHISTA FUCIOLA.—FUCUS ELACHISTA.

Tufts an inch long or so, pencilled, of an olive or rusty-brown hue. A parasite on Fucus vesiculosus, very common. Annual. Summer.

O. S. E. flaccida. Parasitical on *Cystoseira fibrosa,* common. Annual. Summer. Filament half-an-inch long, dull olive-brown.

E. curta. On Fuci, filaments minute. A very little known plant, not found by any recent collector.

E. pulvinata. Parasitical on *Cystoseria ericoides.* Annual. Summer and autumn. South of England and West of Ireland. *Tufts* dense, composed of innumerable minute filaments.

E. stellulata. Parasitical on the fronds of *Dictyota dichotoma.* Torquay. Mrs. Griffiths. Tufts very minute. Star-shaped.

E. scutulata. Parasitical on the thongs of *Himanthalia lorea.* Annual. Summer. *Tubercles*

resembling long warts, half-an-inch to an inch or more in length.

E. velutina. Parasitical on the thongs of *Himanthalia lorea*; frequent also on Fucus serratus. Annual. Summer. Annual. Spreading in thin, indefinite, velvety patches, often accompanying the last species.

MYRIONEMA.

Name signifying *numberless* and a *thread.*

"Minute *parasites,* consisting of a mass of short, erect, simple-jointed filaments, which spring from a thin expansion formed of decumbent, cohering filaments, spreading in patches on the surface of other algæ. *Spores* oblong, affixed either to the erect or to the decumbent filaments."—*Harv.*

MYRIONEMA STRANGULANS.—RING-LIKE MYRIONEMA.

"Parasitical on Ulvæ and Enteromorphæ. Annual. Summer. Forming a small, dark-brown, dot-like patch on the flat frond of the Ulva, or a ring-like collar round the branches of *Enteromorphæ*." Patches convex, filaments club-shaped, spores on short stalks.

O. S. *M. Leclancherii.* On decaying fronds of *R. palmata* and *Ulva latissima*. Annual. Summer and Autumn. Probably common. Torquay and Down Coast. Forms larger and thinner spots than the preceding. Filaments cylindrical, spores on long stalks.

M. punctiforme. Parasitical on *Ceramium rubrum, Chrysymenia clavellosa,* &c. Patches very minute, at first flat, then globose. Spores very narrow.

M. clavatum. "On a thin purplish crust (*Hildenbrantia rubra?*), which covers the pebbles at

half-tide level. The parasite is so much the colour of the crust, that it requires a microscope to detect it." Appin, Argyleshire.—"On stones covered with *H. rubra,* at Falmouth, not uncommon."—*Mr. W. P. Cocks.*

ECTOCARPACEÆ.—ECTOCARPUS TRIBE.

Articulate dark or olive-green coloured sea-weeds; with filiform, slender fronds, cartilaginous or flaccid, not very juicy. "The spores are (generally) external, attached to the jointed ramuli."

From others of the olive sea-weeds, the plants of this tribe are easily known by their *jointed* fronds. Owing to the different structure of these articulations in the Sphacelaria and Ectocarpi each are arranged in two small sub-divisions, named respectively Sphacelarieæ and Ectocarpeæ; in the former each articulation consists of several cells surrounding the central portion; in the latter they are composed of simple cells joined end to end;

independently of these microscopic characters, the genera of each subdivision differ much in outward character; in Cladostephus and Sphacelaria the texture is firm and rigid, adhering very imperfectly to paper, while in Ectocarpus and Myriotrichia the species are often smooth and soft as floss silk, and firmly adhere to paper. The Ectocarpi are a difficult genus, and it is necessary for their discrimination to have recourse to the microscope, and even then they are not easily distinguished when without fruit. Myriotrichia comprises two small species, parasites; the one M. clavæformis on Chorda lomentaria; the other M. filiformis on the same plant, and occasionally on Asperococcus echinatus; this latter is much the most abundant kind, and grows on the Chorda, when growing in shallow pools, exposed to the light. The supposed new species of Ectocarpus ,figured under the name of E. tessellatus in the first volume of the "Naturalist," has proved on further investigation only a variety of E. fasciculatus.

GENERA OF THE ECTOCARPUS TRIBE.

Cladostephus. Stem not articulated, the ramuli alone jointed and set in whorls.

Sphacelaria. Stem articulated, branched. Ramuli distichous pinnated.

Ectocarpus. Stem jointed, very slender, hair-like, generally much branched and flaccid.

Myriotrichia. Stem unbranched; ramuli in whorls, tipped with transparent fibres.

CLADOSTEPHUS.

Name meaning a *branch* and a *crown.*

Frond inarticulate, rigid; whorled with short-jointed ramuli. "*Fruit* elliptical pedicellate. Spores borne by accessory ramuli."

CLADOSTEPHUS VERTICILLATUS.—WHORLED CLADOSTEPHUS.

From three to nine inches high, much branched,

regularly set with close whorls of fine short hair-like fibres (or ramuli) which curve inwards. Colour a dull olive-green. "In winter," according to Dr. Harvey, "these whorled ramuli fall off, and the frond becomes clothed with irregularly disposed, slender (accessory) ramuli, which bear numerous lateral stalked spores." And in summer Mrs. Griffiths finds dark-coloured grains imbedded in the withered tips of the ramuli; the same occurs in the next species, and in the Sphacelaria. Grows on rocks and corallines. Frequent. Summer and winter.

CLADOSTEPHUS SPONGIOSUS.—SPONGY CLADOSTEPHUS.

The branches of this species are so thickly set with short bristle-like fibres as to make it appear, when first taken out of the water, like a piece of wet sponge. Colour dull brown or dirty olive-green. Substance rigid; both this and the preceding will require to be gummed on the paper on which it is intended to preserve them. Grows

on rocks, stones, and corallines. Common. Summer and Winter.

SPHACELARIA.

Name referring to the *withered* tips of the fertile branches

Filaments jointed, rigid, distichously branched, pinnated, rarely forked or simple. Tips of the branches distended and containing a dark granular mass. *Fructification.* Oval spores borne on the ramuli.

SPHACELARIA FILICINA.—FERN-LIKE SPHACELARIA.

This beautiful and rare species I find occasionally thrown up on the beach at Minehead; lower down the Bristol Channel, it is found at Ilfracombe and at St. Agnes, on the north coast of Cornwall. At the Long Rock, in Mount's Bay, it grows, but very sparingly. Plymouth, Salcombe, in Devon. Jersey, Holyhead, and Youghal, are the other recorded localities. Mrs. Gulson has added a new one at Exmouth, and the specimens from thence are

particularly well-grown. Stem shaggy at the base and rather thick, from three to four inches high, the branches slender, delicately pinnate, and resembling in aspect a miniature fern-leaf. Colour, when fresh, a brownish straw, changing, when dry, to a light and delicate olive-green. Grows on rocks and algæ near low water mark. Perennial. Summer and Winter.

SPHACELARIA SERTULARIA.—SERTULARIA-LIKE SPHACELARIA.

This, Dr. Harvey thinks, ought, perhaps, rather to be regarded as it used to be—viz., as only a slender and small variety of the former plant—than a distinct species. It differs from *S. filicina* in its very patent branching, and is found parasitical on algæ dredged up from a depth of from four to fifteen fathom water. Brighton, Isle of Wight, Jersey, Torbay, and other places on the south coast. Carrickfergus, Roundstone Bay, Cunnemara.

SPHACELARIA SCOPARIA. — BUSHY SPHACELARIA.

Stem at the base shaggy, in the upper part branched in a pinnate manner; "the pinnæ short and spine-like, or long and again pinnate." From two to five inches high. Colour, dark olive-green. Substance, harsh and rigid. A much coarser and more bushy species than either of the former. Grows on rocks, stones, and corallines. Southern coasts of England frequent. Frith of Forth. Irish coasts, in several places, but not frequent.

SPHACELARIA PLUMOSA.—FEATHERY SPHACELARIA.

A beautiful and rare kind, resembling delicate black feathers. From two to six inches high, irregularly branched; the pinnæ are very closely set on the branches, opposite and spreading out on each side the pinnule. Grows on rocks near low water mark. Perennial. South coasts of England.

Beachy Head. Several places in South Devon. Land's End. Ilfracombe. Near Caernarvon, North Wales. Wicklow. Balbriggan. Howth. Belfast Bay. Frith of Forth. Kilbride. Orkney. Aldingham, Lancashire, and the Island of Walney, Miss E. Hodgson.

SPHACELARIA CIRRHOSA.—TUFTED SPHACELARIA.

A very variable species, smaller than the last, tufted and branched. In the var. *ægagropila*, the branches are thickly set with spine-like pinnæ, "forming a dense round ball." This form is common at Falmouth, and is found on the west of Ireland. The var. *patentissima* has the ramuli irregular, and issuing at right angles. Found on the shores of Bute. A small and dwarf variety, not above half-an-inch long, grows on the stems of Desmarestia aculeata; of this I have received examples from Falmouth. In the usual form of the plant it grows in star-like tufts, or closely invests the stems of algæ, and somewhat

resembles small specimens of S. plumosa, but the ramuli are far less close and regular, and the joints of the stem very evident. Colour, a dark brown. Substance rigid. Grows on other algæ.

O. S. S. fusca. Sidmouth. Exmouth, Mrs. Gulson. St. Michael's Mount. Anglesea. Newton Nottage, Worm's Head, and other places in Gower. "Tufts three to five inches long, varying in colour from a dull to a reddish brown."—*Dillw. Conf.* t. 95. Filaments slender, with very few ramuli.

S. radicans. "In the sea, on sand-covered rocks, in various parts of Great Britain and Ireland. Dunmore. Waterford. Appin, Argyleshire. Orkney. Torbay. Mount's Bay. Land's End. Ilfracombe. *Filaments* rising from a few decumbent fibres, forming small tufts from half an inch to an inch in height. *Branches* few, scattered, and mostly simple. *Spores* abundant, scattered over the branch. *Colour*, a dull greenish-olive. *Substance* rigid."

S. racemosa. Frith of Forth. "Allied to he last, but larger, and chiefly distinguished by its racemose spores."

ECTOCARPUS.

Name signifying *external fruit.*

Filaments capillary, jointed, olivaceous, or brown, flaccid, without longitudinal striæ (streaks). *Fruit.* Either external or imbedded *spores;* or lanceolate, linear, or conical *silicules* (pod-like bodies); or granular masses, formed in consecutive cells of the branches."

ECTOCARPUS TOMENTOSUS.—SPONGY ECTOCARPUS.

Filaments very fine, and twisted together into a more or less branching spongy frond of an olive green or dull brown colour. The *stalked* silicules, obtuse and *linear*-oblong in shape, distinguish this species (microscopically) from others of the genera. Grows on rocks, wood-work, and the larger algæ.

ECTOCARPUS LITTORALIS.—SHORE ECTOCARPUS.

Filaments coarser than in the preceding kind, from six to twelve inches long; when young forming small tufts of an olive-green colour, changing to brown at a more advanced period, and then frequently floated ashore in abundance. It is a very common plant, growing indifferently upon the larger algæ and submerged substances within the tidal range, and is to be found throughout the year. *Fructification.* Imbedded in the substance of the branches in the form of oblong swellings.

ECTOCARPUS MERTENSII.—MERTENS' ECTOCARPUS.

A beautiful and rare species, with slender branches, not entangled, bearing spreading ramuli. Colour olive-green. In ramification this plant bears a considerable resemblance to the Sphacelaria genus, but differs from it in its flaccid substance. Grows on mud-covered rocks, near low water mark, and

at a greater depth. Annual. April and May. Rare. Sea-coast of Durham. On the beach at Yarmouth. Sidmouth. Salcombe, very fine. Mount Edgecumbe. Marazion, beyond St. Michael's Mount. Ilfracombe. Bantry Bay. Roundstone Bay, Cunnemara. Cove of Cork. Malahide. Strangford Lough. Carrickfergus. Orkney.

O.S. E. amphibius. Filaments two to three inches high, forming small, indefinite tufts, growing on the mud or attached to various substances. *Silicules* usually sessile, very long and spine-like, intermediate in character between the stalked silicules of E. siliculosus and the immersed fruit of E. littoralis. Discovered by Mr. Thwaites in tide ditches of the Avon, near Bristol. "Not unfrequent in salt-water ditches on the Norfolk coast."—*C.H.D.*

E. fenestratus. Grows in small slender tufts, an inch or two high. *Silicules* stalked at first, club-shaped, and then elliptic-oblong, obtuse, densely striate transversely, and cross-barred, dark-brown. The plant itself is a pale green. Salcombe, Devon, Mrs. Wyatt. May.

E. tessellatus. Filaments somewhat tufted, from two to four inches long, very light and feathery as they float in the sea; not much branched, as compared with other species of Ectocarpus, but bearing a remarkable outward resemblance to E. fasciculatus. *Silicules* sessile, abundantly scattered on the upper surface of the penultimate ramuli, varying in shape from oval to elliptical, and sometimes inclining to reniform, regularly *tessellated* with minute dark squares, which are clearly defined under a glass of moderate power by pellucid lines, that intersect each other at right angles. Discovered by the Rev. F. W. Hayden in July, 1851, at Filey Bridge, Yorkshire. Annual. Summer. Grows on rocks, shells, at low water, and completely clothes the fronds of *H. lorea,* in the above locality." See for Fig. and description, vol. 1st, p. 149, of the "Naturalist."

E. fasciculatus grows on the larger algæ. Annual, summer. Not uncommon on *L. digitata, L. bulbosa,* and *H. lorea.* Tufts from one to two inches high. Ramuli to the naked eye appear very

dense and tufted; in reality they are secund on the branchlets. *Silicules* sessile, ovate, pointed, secund on the ramuli. Colour a dark olive-green.

E. Hincksiæ. Parasitical on *L. bulbosa*, probably not uncommon. Coasts of England, Ireland, and Scotland. First noticed at Ballycastle, Giant's Causeway, by Miss Hincks. In Mount's Bay, Cornwall, plentiful on the stems of *L. bulbosa*. Plymouth. Torbay. Exmouth, Mrs. Gulson. Aberdeen. Dark olive-green, tufted, branches furnished with secund ramuli, pectinated on their upper side. *Silicules* conical, sessile, lining the inner face of the ramuli.

E. crinitus. Spreads over mud in extensive fleeces of a bright bay colour. *Spores* globose, scattered, sessile. Appin, Argyleshire. Watermouth in North Devon.

E. pusillus. Parasitical on *Polysiphonia ingrescens*, and other algæ. "Like a tuft of pale brown wool." Mrs. Griffiths. *Spores* sessile, roundish oblong, plentiful, often two or three together, or whorled. Torquay and Land's End.

E. distortus. Growing on *Zostera* at Appin, Argyleshire. Tufts four to eight inches long, dense, matted, deep chestnut-brown, filaments angularly bent. Spores obovate, sessile, or nearly so.

E. Landsburggii. This has the habit of the above species, but is of a much more rigid, tenacious substance, remaining undecayed after long steeping in fresh-water. Dredged in deep water. Annual. Summer. Lamlash, Dr. Landsborough. Roundstone Bay, Galway. Dr. W. H. Harvey.

E. longifructus. "Habit of *E. littoralis,* and very nearly related to that species, but the fruit is more luxuriant, and the branching more regularly opposite. Tufts six inches long." Discovered at Skail, Orkney, by Mrs. Moffat.

E. granulosus. Tufts, greenish or yellowish, four to eight inches long, upper branches and ramuli opposite. *Spores* large, solitary, elliptical, sessile born on the upper side of the ramuli. Parasitical on the smaller algæ between tide-marks Annual. Summer. Shores of England and Ire-

land. Frequent on the south coast of the former, Bantry Bay. Shores of Cork.

E. Sphærophorus. Grows in fine tufts, mostly on *Ptilota sericea,* between tide-marks. Colour, olive or yellowish brown. Tufts from one to three inches high, upper branches spreading. *Spores* globose, sessile, either opposite to each other or to a branchlet. Annual. Summer. Rather rare. Sidmouth. Torquay. Mount's Bay, Mousehole, Sennen Cove, and the Land's End, in Cornwall. Milford. Menai Bridge on *Conferva rupestris.* In a narrow darkened chasm, on the east side of Eda, Orkney on *P. sericea* and *C. rupestris.* Appin, Argyleshire, on *C. rupestris.* Bantry Bay. *E. brachiatus.* Grows parasitical on *Rhodymenia palmata.* From two to four inches high, very feathery and much branched. *Spores* imbedded in the branchlets. Annual. Summer. Rare. Torquay, Mrs. Griffiths. Mount Edgecumbe, Rev. W. S. Hore. Cley, Norfolk Coast.

MYRIOTRICHIA.

Name, *numberless* and a *hair*.

Filaments hair-like, flaccid, jointed, beset on all sides with simple spine-like ramuli, clothed with long colourless fibres. *Fructification.* Elliptical spores.

MYRIOTRICHIA CLAVÆFORMIS.—CLUB SHAPED MYRIOTRICHIA.

Fronds, half an inch long, tufted, flaccid. "Stem densely beset with quadrifarious ramuli, which gradually increase from the base upwards, giving the frond a club-shaped figure." Parasitical on *Chorda lomentaria*. Annual. Summer. Discovered by Miss Hutchins forty years since, at Bantry Bay. Cable Island, near Youghal. Balbriggan. Howth. Ballantrae, Ayrshire. Torquay. Falmouth Bay. Mousehole, near Penzance. Jersey.

MYRIOTRICHIA FILIFORMIS.—SLENDER MYRIOTRICHIA.

Fronds an inch or more in length, very slender, straight or often twisted into bundles; the stem at intervals set with dark-coloured knobs, which, under the microscope, are found to consist of very minute ramuli. This is described in the "Manual" as a much taller and slenderer plant than the former, and easily known from it by the *interrupted* ramuli, which are much shorter in this, and do not increase in length towards the upper part of the stem.

Parasitical on *C. lomentaria* and *Asperococcus echinatus* at times accompanying the former species.

SERIES II.

RHODOSPERMEÆ.

THE RED SERIES.

Seaweeds of a rose-red, purple, or red-brown colour, leafy, cylindrical, or filamentous. Fructification of two kinds, formed on distinct plants. 1. *Spores*, contained either in external or immersed conceptacles, or densely aggregated together, and dispersed in masses through the substance of the frond. 2. *Spores* (called *tetraspores*), either external or immersed in the frond, rarely contained in proper conceptacles, each *spore*, when mature, separating into four *sporules*. *Antheridia* (not observed in all), filled with small yellow bodies.

ANALYSIS OF THE TRIBES.

1. Frond with a calcareous coating. Corallinaceæ.
   Frond cellular or filiform, not encrusted . 2

2. Fronds (usually) filiform, and jointed either externally or internally, or composed of articulated fibres, combined together by gelatine 3
   Fronds continuous 5

3. Spores contained in external urn-shaped receptacles (*ceramidia*). Rhodomelaceæ.
   Spores not in ceramidia 4

4. Spores contained in naked berry-like receptacles, termed *favellæ*. Ceramiaceæ.
   Spores immersed in the frond or subexternal. Cryptonemiaceæ.

5. Tetraspores scattered 6
   Tetraspores in defined spots. Delesseriaceæ.

6 { Tetraspores immersed in the branches and ramuli. Laurenciaceæ.
Tetraspores either spread over the frond, or in cloud-like spots. Rhodymeniaceæ.

The sea-plants forming the red series thrive and assume their richest hues in deep water; in shallow pools exposed to the sunlight, they never attain their full and natural colour, but degenerate to a greenish or yellowish white; this is particularly remarkable in Laurencia pinnatifida, Chondrus crispus, and Ceramium rubrum. The double system of fructification, delicately membranaceous, leaf-like, or often filamentous fronds of a red or pinky hue, soon changing colour and decomposing in fresh water, form the main characteristics of this series. In the Coralline tribe, there is in the *outward* structure and appearance of the species a remarkable dissimilarity from the other red sea-weeds, arising from the presence of carbonate of lime in their tissues, which gives them a stony hardness, and

completely conceals from view the internal character of the frond, to obtain a knowledge of which it is first necessary to dissolve the lime by means of an acid, when the structure and affinity of these plants with other members of this series will at once become apparent.

RHODOMELACEÆ.—RHODOMELA TRIBE.

Sea-weeds of a red or brown-red colour, with leafy or thread-like, areolated or articulated fronds, composed of many-sided cells. Fructifications of two kinds :—1. Ovate or urn-shaped bodies, called *ceramidia*, containing a tuft of pear-shaped spores. 2. Tetraspores in swollen ramuli, or in lanceolate receptacles, termed *stichidia*.

All the British genera of this tribe, with the exception of Odonthalia, are slender filiform species, with more or less distinctly articulate fronds ; in the Polysiphoniæ this structure is clearly visible, while in Dasya the ramuli alone show the joints, and in the three genera, Rhodomela, Bostrychia,

and Rytiphlæa, they are internal, and almost entirely hidden by a coating of cells of greater or less thickness. One of the most easily-recognized seaweeds of the Rhodomela tribe, is the Toothed Odonthalia, our only representative of the leafy-fronded Rhodomelaceæ. In warmer seas many beautiful species are found belonging to the different genera included under this section. In Amansia the cells of the delicate leaf-like fronds are all regularly twelve-sided, and of exactly the same length; this structure is what is meant by *areolated*, and resembles mosaic work. Of the filiform kinds, Polysiphonia fastigiata is an abundant species, growing in thick tufts of a dark-brown colour, upon the Fucus nodosus. The Polysiphonia are a difficult genus for the learner; for this reason, only a few of the species are described at length in the following pages. The Scarlet Dasya is a very common species often used in ornamental work; it is the only kind of Dasya common on our shores. The other British genera in this tribe include but seven species; in habit they resemble some of the

Polysiphonia, and are not easily distinguished from them. Rhodomela, with filiform inarticulate fronds, contains two species: R. lycopodiodes, with fronds from four to eighteen inches long, grows on the stems of Laminaria digitata, and is common on the northern coasts of England, Scotland and Ireland; R. subfusca is a much branched kind, with rather flaccid ramuli, which adhere to paper; these drop off during the winter, and the plant then appears with rigid broken branches; it is a frequent species, growing either on rocks or algæ: colour, in this a reddish-brown, in the former a purplish-brown; becoming in both species almost black when dry; the name Rhodomela, meaning *red black*, is given in allusion to this change of colour. Many, or almost all, of the plants of this tribe become much darker in drying. The next genus, Bostrychia, includes but one British species, B. scorpioides, which grows either in the sea or in salt-water ditches at the roots of flowering plants, whence it was formerly known as *Fucus amphibius*. It is of a pale purplish, brownish, or greenish colour,

varying in different localities, and changing to a blacker hue in drying: the extreme tips of the slender and entangled branches of this plant are rolled inwards like a ram's horn. When viewed through the microscope, the surface-cells of the frond look like a delicate and regular piece of mosaic-work. In Rytiphlæa, the frond is transversely striate and reticulated, four British species are included in this genus: R. pinastroides is remarkable for its secund and usually hooked pinnæ. R. complanata, the only species with flattened fronds, is of rare occurrence. R. thuyoides, a much commoner plant, "may always be known from it," says Dr. Harvey, "by its darker colour, cylindrical stems, and generally by a narrower frond. In ramification and general habit there is much similarity. The two may sometimes be found growing in close proximity, and even mixed together; but I have generally noticed that R. thuyoides, which is the stiffest in substance, usually grows in shallow parts of the tide-pool, sometimes standing out of the water, while R. com-

planata never dies during the recess of the tide." The fourth species, R. fruticulosa, by its diffuse and spreading habit, may easily be distinguished from the foregoing, which are all *erect* in their growth.

GENERA OF THE RHODOMELA TRIBE.

Odonthalia. Frond flat, serrated with a faint midrib. Colour very dark red.

Rhodomela. Frond cylindrical, inarticulate, opaque.

Bostrychia. Frond cylindrical, inarticulate, dotted.

Rytiphlæa. Frond cylindrical, inarticulate, transversely striate.

Polysiphonia. Fronds thread-like, articulate, longitudinally striate.

Dasya. Fronds cylindrical, with inarticulate stems and spreading jointed ramuli.

ODONTHALIA.

Name, a *tooth* and a *branch*, in allusion to the toothed frond.

Frond plane, between membranaceous and carti-

laginous, dark vinous red, with an imperfect or obsolete midrib, and alternately toothed margin. *Fructification.* 1. *Ceramidia,* containing spores; 2. *Lanceolate* pods (stichidia), containing tetraspores.

ODONTHALIA DENTATA.—TOOTHED ODONTHALIA.

Fronds tufted, from three to twelve inches in length, much branched in an irregular pinnate manner, with a slight and imperfect midrib at the base; branches narrow toothed or pinnatifid. Fructification borne on little slender hair-like stalks along the margin of the frond. Substance between cartilaginous and membranaceous. Colour a deep red, becoming darker in drying. Grows on rocks in the sea, in fruit, from January to March. Frequent on the shores of Scotland, and the north of England and Ireland.

RHODOMELA.

Name meaning *red black*, in allusion to the change of colour in these plants when dry.

Frond filiform, solid, much branched, inarticulate, reticulated; outer surface of the frond consisting of minute, irregular, coloured cellules. *Fructification* twofold, on distinct plants. 1. *Ceramidia*, containing pear-shaped spores. 2. *Tetraspores*, contained in lanceolate pods, *stichidia*, or in swollen branchlets.

RHODOMELA LYCOPODIODES. — WOLF'S-CLAW RHODOMELA.

Fronds in summer densely set with slender ramuli. In the winter state of the plant these are short, rigid, half-an-inch to an inch in length. The fructification is produced in summer on the ramuli. Substance cartilaginous, colour purplish, changing to black in drying. Grows on the stems of *L. digi-*

tata. Perennial. Summer. Common on the Scotch shores, and on the north of England and Ireland. Remarkably fine at Bangor, Co. Down.

RHODOMELA SUBFUSCA.—PURPLISH-BROWN RHODOMELA.

Fronds as in the preceding species, clothed with numerous ramuli during summer; set with alternate branchlets, often crowded towards the end of the branches. Stem, four to ten inches high; branches virgate very variable in ramification. Colour, a reddish brown, not unlike that of *Hypnea purpurascens* when recent, but becoming much darker in drying. Grows on rocks and algæ. Perennial. Summer. Frequent.

BOSTRYCHIA.

Name from a *ringlet* or *curl of hair*.

Frond dull, purple, filiform, much branched, inarticulate, dotted. Cells of the outer surface of the

frond cubical. *Fructification.* 1. *Ceramidia;* 2. *Tetraspores,* contained in terminal, lanceolate pods.

BOSTRYCHIA SCORPIOIDES.—TANGLED BOSTRYCHIA.

Fronds entangled, very much branched, spreading very slender, furnished with small tufts of forked patent ramuli; the uppermost ones curled inwards. Colour, pale purplish, becoming blackish in drying. Substance somewhat cartilaginous, tender. This genus is anomalous among the Rhodomela tribe, the species growing indifferently in situations where fresh water flows into the sea, or in ditches of brackish water at some distance from the coast. Our native species varies in hue according to the locality; it is sometimes of a brownish or greenish colour. Grows on muddy sea-shores near high water-mark, at the estuaries of rivers, in salt water ditches and marshes, adhering to the roots of flowering plants; also on sub-marine rocks within tide-marks. Annual. Selsey Marshes. North Wales. Shoreham on *Atriplex portulacoides.* Mouth of

the River Dart. Mouth of the River Otter, at Budleigh Salterton, Miss Cutler. Tydd Marsh, Cambridgeshire. Shore of Blackwater, near Maldon. Plymouth. Barmouth. Pool near Dolgelly, and at the Menai Bridge. Port Stewart, Ulster. Baldoyle. River Shannon, at Tarbert.

RYTIPHLÆA.

Name from a *wrinkle* and the *bark*, in allusion to the appearance of the surface when dry.

Frond filiform or compressed, pinnate, transversely striate, reticulated; outer surface composed of several rows of minute, irregular, coloured cellules. *Fructification.* 1. *Ceramidia,* containing pear-shaped spores. 2. *Tetraspores,* contained in *stichidia,* or in the swollen ramuli.

RYTIPHLÆA PINASTROIDES. — HOOKED RYTIPHLÆA.

Frond from four to eight inches high, round, almost devoid of branches at the base; much

branched above the branches, alternate or secund, spreading in a fan-like manner, the branchlets bearing secund, erect ramuli; sometimes straight, but more frequently with their tips hooked inwards. "The whole plant marked, at short intervals, with transverse striæ, which give it a jointed appearance." Substance, cartilaginous. Colour, a dull red, becoming black in dying. Grows on rocks near low water-mark. Perennial. Fruiting in Winter. Southern shores of England, frequent.

O. S. *R. complanata*. Very rare. Grows on the rocky beds of shallow tide-pools, exposed at low water-mark to full sunshine. Perennial. Summer. Dredged in Plymouth Sound. Land's End. Bantry Bay. Caarush Point, Miltown; abundant in one or two tide-pools, but very local.—*Dr. Harvey.* Fronds compressed, two or three inches high; branches with acute axils. Colour, a dark brownish red.

R. thuyoides. Grows on rocks in tide-pools. Perennial. Summer and Autumn. Not uncommon. Very abundant on the West of Ireland. Fronds

three or four inches high. Cylindrical, branches with rounded axils. Colour, a dull brown, or brownish-yellow.

R. fruticulosa. Grows between tide-marks on sand-covered rocks. Perennial. Summer. Common. Fronds three to six inches high, much branched from the base; axils of the branches very patent. Articulations very obvious in the ramuli, and marked with transverse striæ. *Antheridia* in this and the preceding kind constantly occur in summer, and give a yellowish tinge to the plants.

POLYSIPHONIA.

Name signifying *many-tubed*, in allusion to the structure of the frond.

Frond filamentous, partially or generally articulate, joints longitudinally striate, composed internally of parallel tubes ranged round a central cavity. *Fructification* double on distinct plants. 1. *Ceramidia* containing pear-shaped spores. 2. *Tetraspores* imbedded in swollen branchlets.

POLYSIPHONIA URCEOLATA.—HAIR-LIKE POLYSIPHONIA.

Loosely entangled in large tufts, of from three to nine inches in length, the thickness of horse-hair at the base; very stiff on removal from water, and not adhering well to paper. Colour a dark red. Grows generally on rocks. *β patens*, a variety with recurved ramuli and fewer branches, is found clothing the stems of Laminaria digitata. Summer.

POLYSIPHONIA FORMOSA.—BEAUTIFUL POLYSIPHONIA.

Filaments much branched, very slender, flaccid, from six to ten inches high. Colour reddish-brown. This plant has, from the wavy outline of its branchings, a peculiarly graceful appearance when spread on paper. It is usually a much more slender species than the preceding. Grows on rocks, &c., between tide-marks, mostly in bays and estuaries. Annual. Summer. Not uncommon.

POLYSIPHONIA FIBRATA.—FIBROUS-BRANCHED POLYSIPHONIA.

With many slender branches, densely tufted, of a reddish-brown colour; very soon decomposing in fresh water, and extremely soft and tender in substance. The ramuli produce delicate fibres at their tips, to which are attached the antheridia in tufts of a golden-yellow colour. Grows on rocks, stones, and algæ, between tide-marks. Not uncommon. Annual. Summer and Autumn.

POLYSIPHONIA ELONGATA.—"LOBSTER-HORN" POLYSIPHONIA.

Stems cartilaginous, irregularly branched; during the summer clothed with slender many-tipped crimson ramuli; these fall off at the approach of winter, when the branches appear bare and broken at the tips. Colour brownish-red: the ramuli crimson. Substance in the stem rigid, in the ramuli soft, and adhering well to paper. Grows on stones, shells, corallines, &c. Biennial. Spring.

POLYSIPHONIA FASTIGIATA.—TUFTED POLYSIPHONIA.

Filaments rigid, bristly, all nearly of the same length; forming round tufts, repeatedly forked. Grows abundantly on the fronds of Fucus nodosus, and on the old stems of Fucus vesiculosus. Colour brownish; black when dry. Substance rather rigid.

POLYSIPHONIA BYSSOIDES.—FEATHERY POLYSIPHONIA.

From four to twelve inches long, the main stem undivided, and set throughout its length with alternate or opposite branches, which are more or less densely clothed with slender fibres which give a peculiar soft and feathery appearance to this species, and make it resemble a Dasya rather than a Polysiphonia. Substance generally soft and flaccid. Colour a pinkish red, which soon exchanges to

brown on exposure to the air or in drying. Grows on rocks, &c. Annual. Summer. Abundant on the eastern and southern shores of England and Ireland. Rare in Scotland and the west of Ireland. Frith of Forth. Ayrshire. Bantry, Malbay.

O. S. *P. stricta.* "An ill-defined, confused species." Grows on sand-covered rocks.

P. pulvinata, "resembles P. urceolata in miniature, but has the soft substance of the P. fibrata, and is a much more slender plant." Grows on rocks and algæ between tide-marks. Annual. Summer. Not uncommon.

P. spinulosa. An extremely rare species, of which only one specimen was found by the late Captain Carmichael, at Appin, Argyle.

P. Richardsoni. Colvend, Dumfries; only a single example of this plant is preserved in the Hookerian Herbarium, from which the plate in the Phycologia Britannica, t. x. was taken.

P. Griffithsiana. Parasitical on Polyides rotundus at Torquay. Isle of Portland. Annual. Summer. Very rare. "Chiefly remarkable for

the *equality* of its short joints, and for its property of resisting fresh water."

P. elongella. "This closely resembles small specimens of P. elongata, but it is easily and clearly distinguished by the distinctly jointed branches, and the *parallel* (not *reticulated*) veins which they contain." Grows on rocks, &c., between tide-marks. Biennial. Spring. Rather rare; but generally distributed round our shores.

P. Grevillii. Shores of Bute, on the larger algæ, only a variety of the following:—

P. violacea. A species not very unlike P. fibrata, but differing from it in its *inarticulate* stem and finer and larger growth.

P. Carmichaeliana. Parasitical on Desmarestia aculeata at Appin. The single specimen of this plant, found by Captain Carmichael, is preserved in Sir W. J. Hooker's Herbarium.

P. fibrillosa. Grows on rocks and stones and on algæ between tide-marks. Annual. Summer. Common. Substance very tender, and soon decomposing. "Colour a pale starw, or some-

what rosy when recent, becoming purplish in drying."

P. Brodiæi. Grows on rocks and the larger algæ near low water-mark. Annual. Summer. Common on the rocky shores of Scotland and the south and west of England and Ireland. Channel Islands. A large species of a dark brown colour, and soon decomposing and giving out a disagreeable smell in fresh water. "The inarticulate stem, and long, simple, robust branches, clothed with pencils of delicate filaments, strongly mark the species."

P. variegata. Grows on mud-covered rocks in bays and estuaries; also on Zostera, Chorda, &c. Annual. Summer and Autumn. Very local. St. German's River, Beggar's Island, Trevol, Torpoint, and various other places near Plymouth. A beautiful species resembling P. elongella in habit, but easily distinguishable from it by its bright purple colour; hitherto it has only been found in the vicinity of Plymouth, where it was first noticed by the Rev. W. S. Hore. On the shores of France and Spain, in the Adriatic, and

on the east coast of North America in several places, Dr. Harvey says it is an abundant species.

P. obscura. Spreads over marine rocks at half-tide level; also parasitical on Fuci and on some of the small algæ. Jersey. Sidmouth. "Tufts of small size densely matted together. Articulations visible in all parts of the frond. Colour a dark brown-red."

P. simulans. Grows on rocks, &c., in tide-pools, near low water-mark. Annual. Summer. Rare. Bathing Cove and Tor-Abbey Rocks, Torquay. Bovisand, near Plymouth. Falmouth. Jersey, Valentia, Kerry. Skaill, Orkney. This species was for some time confounded with P. spinulosa, and described as such; in microscopic character it differs from that in having twelve siphons or tubes surrounding the central cavity; in the true P. spinulosa there are but four. In outward aspect it is exceedingly variable, sometimes resembling P. subulifera, and at others P. nigrescens; in allusion to these deceptive appearances it received the specific name of *simulans*. Mrs. Griffiths de-

scribes it as follows :—"Substance stiff and little. Colour reddish. Stems set with spines which hold the plant together so that it is difficult to disentangle."

P. nigrescens. A very common species on rocks and stones between tide-marks; it dries of a black colour, and scarcely adheres to paper excepting in specimens collected in the summer, when the ramuli are tender and then adhere better. In autumn and winter this species looks coarse and bushy, from the loss of the more slender branchlets, which disappear at the end of the season. It is a variable species, putting on many different aspects; microscopically it may be known from other species by the very large number of tubes in the stem.

P. affinis. On rocks, &c., in the sea. Carnlough, near Glenarm. Cushendall. Not unlike the preceding, but more flaccid, and with an *ovate* outline.

P. subulifera. Usually grows in deep water, very local. Annual. Summer. Torquay. Wey-

mouth, "parisitical on Rytiphlæa pinastroides and Polyides rotundus, between tide-marks."

Carrickfergus. Roundstone, Cunnemara, very abundant. β Templetoni, a slender variety of this plant found in Belfast Bay. Dr. Harvey says of the present species that "its peculiar thorny habit, well expressed by the specific name, is so unlike that of any other British species of equal size, that it cannot well be confounded with any. To the naked eye it bears a greater resemblance to young specimens of Rytiphlæa fruticulosa than anything else, but is more slender and flaccid, and readily known at all times by the distinctly articulate stem and branches, which have both externally and internally a very different structure."

P. atro-rubescens. Grows on rocks in the sea; not uncommon. Perennial. Summer and Autumn. "Stems densely tufted, or covering the rocks in wide patches, from two to six inches high, thicker than horse-hair, subsimple, more or less furnished with long, alternate, erect, simple branches, which sometimes bear a second series, clothed in more

or less abundance with short, awl or spindle-shaped, erect ramuli." Colour, deep red or brownish, becoming blackish in drying. Substance rigid, adhering slightly to paper.

P. furcellata. Very rare. Floating in the sea at Sidmouth. Dredged in Torbay. Carrickfergus. Roundstone, Cunnemara. Five or six inches long, much entangled, and excessively branched, the divisions dichotomous, very close towards the extremities. Tubes about eight. Colour, a bright brick-red, changing to a deep amber colour. Substance, at first firm, but becoming flaccid immediately.

P. parasitica. Grows on the larger algæ, and more frequently on nullipores at the extreme limit of low water-mark, not uncommon, but nowhere very abundant. Stems somewhat compressed, rigid, simple, distichously branched. Articulations about as long as broad, three-tubed. Colour, rose-red, brownish when dried. Cartilaginous, and adhering imperfectly to paper. Remarkably fine on the Ayrshire coast, and at Arran. Mrs. Gulson

finds on the beach at Exmouth a variety of this plant, which bears much resemblance to Rytiphlæa complanata, and is identical with the so-called Mediterranean species *P. pennata.*

DASYA.

Name *hairy*, in allusion to the slender hair-like ramuli.

Frond filamentous; the stem and branches mostly opaque, composed internally of numerous parallel tubes, surrounding a central cavity; the ramuli jointed; single tubed. *Fructification* two-fold, on distinct plants; 1, *ceramidia*, containing a tuft of pear-shaped spores; 2, lanceolate *pods* (*stichidia*) containing *tetraspores.*

DASYA COCCINEA.—SCARLET DASYA.

Stems rather rigid and firm, minutely hairy; set with alternate or opposite twice-pinnated branches, bearing tufts of many-tipped ramuli. Substances rather cartilaginous, and not adhering very firmly to paper. Colour dark red, becoming

bright scarlet on exposure to the atmosphere. Grows on rocks and algæ near low water-mark. The var. *squarrosa* more slender in its branching, and without hair-like fibres, grows in from four to fifteen fathoms water. Annual Summer—being frequent on all our shores.

O. S. *D. ocellata.* Grows on mud-covered rocks near low water-mark, rare, very fine at Exmouth, Mrs. Gulson. Abundant on the pier at Torquay. Trevol, near Plymouth. Whitsand Bay, ditto. St. Michael's Mount, and Mousehole, near Penzance. Wicklow. Balbriggan. Smerwick Harbour, Orkney. A much smaller species than the foregoing, from one to two inches in height, tufted, and thickly set with upright, spreading, forked ramuli, which are particularly dense towards the tips of the branches. The colour is a brownish or bright purple.

D. arbuscula. Grows on rocks at the verge of low water-mark. Rare in England; not uncommon on the shores of Ireland and Scotland. Salcombe, Devon. Mewstone, Plymouth. Fal-

mouth Bay, "local, but not scarce," Miss Warren. Very fine at Bantry, Ireland. Annual. Summer. A delicate species, from two to four inches high, branched irregularly, set with fine, short, spreading ramuli. Colour a pale pinky brown, at times deep red. Substance flaccid, adhering closely to paper.

D. venusta. A beautiful species, discovered by Miss White and Miss Turner on the shores of Jersey in 1846. Annual? Summer and autumn. Very rare. "Colour a fine crimson-like substance, very flaccid and tender, closely adhering to paper." According to Dr. Harvey this new species resembles in habit Polysiphonia byssoides or Seirospora Griffithsiana more than any British species of Dasya—being intermediate in aspect between the two.

GENERA OF THE LAURENCIA TRIBE.

Bonnemaisonia. Frond filiform, solid, much branched; the branches, with opposite awl-shaped cilia.

Laurencia. Frond cylindrical or compressed, pinnatified; the ramuli blunt.

Chrysymenia. Frond filled with watery gelatine, not constricted or chambered.

Chylocladia. Frond contracted at intervals, filled with watery gelatine.

LAURENCIACEÆ—LAURENCIA TRIBE.

Sea-weeds of a rose-red or purple-colour, usually with cylindrical, rarely compressed, and still more rarely flattened fronds, destitute of midrib; linear inarticulate, though occasionally as in Chylocladia, constricted at regular distances in a joint-like manner. Fructification of two kinds. 1. *ceramidia* external, ovate in form, containing a tuft of pear-shaped spores. 2. *tetraspores* immersed in the branches and ramuli, scattered without order through the surface cells.

The succulent, inarticulate fronds of these plants, having their *tetraspores* dispersed without order through the ramuli, form the principal difference between them and those of the foregoing tribe.

Four genera alone are comprised in our Flora; in Chylocladia the species resemble in form the jointed *Saltwort* (Salicornia), of our marshes, C. kaliformis, and C. articulata, are the commonest species of the genera; C. parvula, a small species, not unlike the former, may be known from it by the joints being always much shorter and of uniform length; the form of the capsular fruit is also different; the capsules are much larger in size in C. kaliformis, and distinctly conical in form. The rare species, C. reflexa, may at once be recognized by its creeping habit, which well distinguishes it from others of the genus; indeed, it is more likely to be confounded with Catenella opuntia at first, than with any of the Chylocladias. Bonnemaisonia asparagoides is a beautiful species, resembling in its feathery aspect the common asparagus plant when going to seed, but infinitely more delicate in its branching, and of much smaller size. Chrysymenia clavellosa is likewise an elegant species of a pink hue, with opposite or alternate branches, bearing ramuli, in shape resembling those of the

stone-crop (*Sedum*); the whole plant, with the root and stem, when entire, forms a perfect little tree in miniature. Laurencia pinnatifida is exceedingly common on our shores; the fronds are usually regularly pinnate, of a dull purple colour; we are told it is of equally common occurrence in the Pacific and Atlantic basins in both temperate and tropical climates; and that all our Laurenciaceæ are also natives of the S. ocean. C. rosea has been lately added to our Flora; from C. clavellosa it is at once known by the very much greater proportional width of the frond: in a specimen which Mrs. Hayden has had the kindness to send me, not more than half an inch in height, the frond is broader than in any variety of C. clavellosa that I am acquainted with. Algologists in their excursions should not forget to search for it, and C. reflexa.

BONNEMAISONIA.

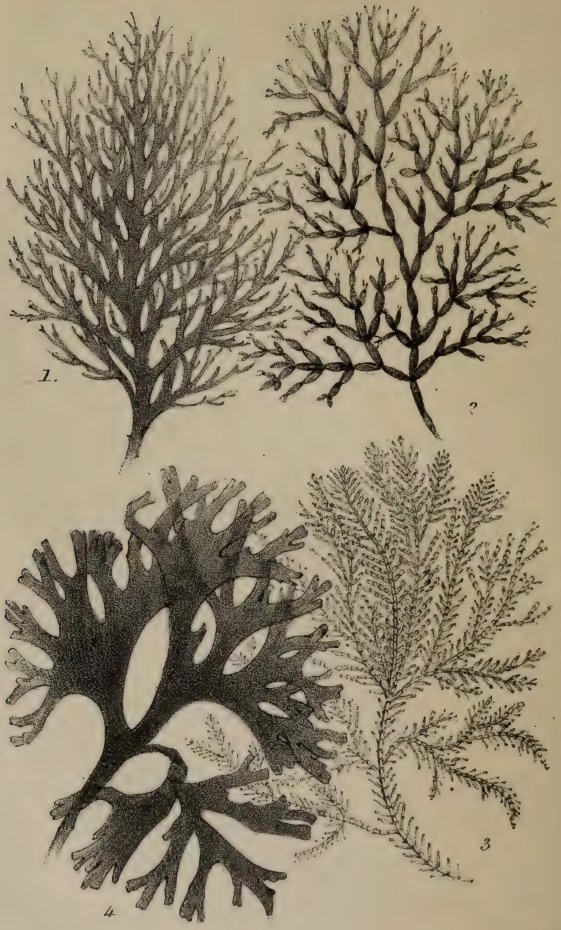
Named in honour of M. Bonnemaison, a French Naturalist.

Frond filiform, inarticulate, compressed or plane; solid; much branched; the branches margined

with distichous, awl-shaped, alternate cilia. *Fructification. Ceramidia,* containing a tuft of pear-shaped spores. *Tetraspores* unknown.

BONNEMAISONIA ASPARAGOIDES. — ASPARAGUS-LIKE BONNEMAISONIA.

From four to twelve inches high, with slender main stem and opposite or alternate branches, regularly set throughout with two rows of alternate hair-like cilia; these in var. *β teres* are much lengthened, and the branches are rounded. The capsules are borne on short stalks opposite to the cilia; they are small roundish bodies, about the size of a pin's point; but though small are clearly visible to the naked eye. "Colour a fine transparent crimson, darker in those from the west of Ireland, and in them becoming darker in drying, while in those from the east of Ireland and south of England the colour fades considerably in drying." Substance soft and flaccid. Grows on rocks near



W. Dickes, Litho.

Fig 1 LAURENCIA PINNATIFIDA

„ 2. CHYLOCLADIA ARTICULATA.

Fig 3. CORALLINA OFFICINALIS.

„ 4. CHONDRUS CRISPUS.

low water-mark, and at a greater depth. Annual. June to September. Sunderland. Yarmouth Beach. Cromer. Torquay, Torpoint, Falmouth, Scilly Islands, Jersey. Kilkee, Malbay, Bantry Bay, Donaghadee, Belfast Bay, Howth, Malahide, Carrickfergus, Saltcoats, Ardrossan, var. β *teres*. At Wicklow and Kingstown Harbour, Dublin.

LAURENCIA.

Named in honour of M. de la Laurencie, a French Naturalist.

Frond cylindrical or compressed, linear pinnately branched; the apices obtuse; structure cellular, solid. *Fructification* of two kinds, on distinct individuals: 1. *Ceramidia*, containing a tuft of pear-shaped spores; 2. *Triparted tetraspores* imbedded in the ramuli.

LAURENCIA PINNATIFIDA.—PINNATIFID LAURENCIA.

A variable plant with tufted fronds from one

to twelve inches high, with pinnatifid or twice pinnatifid branches. In a very common variety, β *osmunda*, the frond is undivided, flat, and with short, many-tipped ramuli; in the variety found in Devon and Cornwall, γ *tenuissima*, the frond is also flat, but the ramuli are very thin, and much branched, branches widely spreading. Substance cartilaginous, but soon decomposing on exposure to the air, and then the smell of this plant is often peculiarly offensive. Colour varying from a yellowish green to a dull dark purple, fading in the air to a pale lilac. *Ceramidia* broadly ovate, placed on the smaller branches. *Tetraspores* imbedded in the ramuli. Grows on rocks, &c., between tide-marks. Annual. June to December. Very common. It has been called the "Pepper Dulse," in Scotland, owing to its biting and aromatic flavour.

LAURENCIA CŒSPITOSA.—TUFTED LAURENCIA.

The characters of this species, which was formerly considered only a variety of the former kind, I copy from the description given in Harvey's "Manual of the British Algæ," p. 98. "On stones, &c., within tide-marks. Annual. Summer. Common. Fronds two to eight inches high, as thick as small twine, cylindrical, or the main divisions slightly compressed, somewhat bare below, much branched above with a pyramidal outline. *Branches* once or twice pinnate, erect or erecto-patent, irregularly set. *Ramuli* very irregular, often much crowded, simple or multifid, terete, tapering to the base, and truncate. *Colour* either a very dark lurid purple, or (under the effects of sunlight) greenish yellow. Almost intermediate between the preceding and following: more cylindrical and narrower than L. pinnatifida; and very different in general habit from L. obtusa."

LAURENCIA OBTUSA.—BLUNTED LAURENCIA.

"From three to six inches high; the stem as thick as pack-thread, of the colour of isinglass, but the outer coats of the branches and their segments have a beautiful pink colour." The ramuli are mostly opposite, short, wedge-shaped, and blunt. *Ceramidia* ovate on the smaller branches; tetraspores immersed in the ramuli. Substance tender and flaccid, but soon decomposing. Colour a fine but fleeting pink. This plant is said to smell like violets. Grows on the larger algæ. Annual. Summer and Autumn. Shores of England and Ireland frequent, but rare in Scotland. Frith of Forth, Ayrshire, Ardrossan, Arran.

LAURENCIA DASYHYPLLA.—SEDUM-LEAVED LAURENCIA.

"Fronds from four to twelve inches high, the

stem often undivided, and set with opposite or alternate branches, the lower ones being the longest, and frequently bearing a second series; all having numerous linear, club-shaped, obtuse ramuli, one or two lines in length, and very much attenuate at base, resembling the leaves of a *Sedum;* the whole frond marked, at short distances, with more or less distinct transverse striæ. Substance somewhat gelatinous, quickly decomposing. Fructification as in the above. Colour a pale fugitive pink or yellowish. Readily distinguished from the preceding by the ramuli tapering towards the base, and from the following by their being obtuse. "Var. *β squarrosa:* tufts intricate, fronds irregularly branched; the branches arched, and more or less recurved; ramuli frequently attenuated at the apex. May, perhaps, be mistaken for *L. tenuissima,* but it rarely, if ever, happens that *all* the ramuli are drawn into long points, or *all* the branches arched and recurved; but the majority are in these conditions."—Harv. Grows on shells, &c., in pools near low water-mark, generally where the surface

is covered with sand or mud. Frequent on the shores of Great Britain, Ireland, and the Channel Islands. β *squarrosa* dredged in four to five fathoms water. Plymouth Sound, Rev. W. S. Hore.

LAURENCIA TENUISSIMA.—SLENDER LAURENCIA.

Branches set with slender bristle-like ramuli, narrowed at their insertion, and more or less tapering at the tips. Fronds tufted, from six to eight inches. Substance very tender, between gelatinous and cartilaginous. Colour, a pale purplish, or pinky red, becoming yellowish. Grows on rocks and other algæ between tide-marks. Very rare. Annual. Summer and Autumn.

CHRYSYMENIA.

Name meaning *golden membrane*, because the species assume golden hues if steeped for some time in fresh water.

Frond tubular, continuous, neither constricted nor jointed, filled with a watery juice, traversed

by a few longitudinal threads. *Fructification.* 1. *Ceramidia,* containing a very dense tuft of angular spores; 2. Triparted *tetraspores* immersed in the ramuli.

CHRYSYMENIA CLAVELLOSA.—STONE-CROP CHRYSYMENIA.

Branches either alternate or opposite, spreading and bearing small narrow ramuli. From three to twelve inches high, and much branched in a pinnate manner. Colour, pale pink; sometimes, in ill-coloured specimens, of a brownish hue. Substance, soft and slippery, adhering very closely to paper. Var. *β sedifolius* has the ramuli between oblong and oval in shape, much crowded and undivided. Grows on stones and algæ between tide-marks. Annual. May to September. Found at various places on the coasts of England, Scotland, and Ireland, but nowhere very common. *β sedifolius* at Lossiemouth. Falmouth Harbour, Miss Warren.

CHRYSYMENIA ROSEA.—WIDE-FRONDED CHRYSYMENIA.

Frond in proportion very much broader than in the above, with opposite, obtuse, elliptical ramuli, tapered off at the insertion. Tetraspores not dispersed through the branches, as in *C.* clavellosa, but collected into distinct *sori*. The variety *orcadensis* is about an inch high; each frond elliptic oblong, fully a quarter of an inch broad, bearing three or four distant pairs of pinnæ of similar form but smaller dimensions. Colour a clear pinky red. Discovered at Skaill, Orkney, by Miss Watt, and described in the "Manual," p. 100, as a distinct species; subsequently Mrs. Gatty and Mrs. Hayden gathered more perfect specimens at Filey, on the Yorkshire coast, "which," writes Dr. Harvey, "seem to connect the Orkney plant with an American species gathered at Newport, Rhode Island, to which I had previously given the name of 'rosea.' Mrs. Gatty's largest speci-

men so nearly resembles one of the American specimens, that it might have been supposed to be from the same locality, while Mrs. Hayden's in its rather broader form approaches the Orkney."

CHYLOCLADIA.

Name signifying *juicy branch*, in allusion to the succulent frond.

Frond (at least in the branches tubular) constricted at regular intervals, and divided internally by partitions; each division is filled with a watery fluid, and traversed by a few longitudinal filaments. *Fructification.* 1. Spherical, ovate, or conical *ceramidia*, containing a tuft of wedge-shaped spores; 2. Tripartite *tetraspores*, immersed in the smaller branches and ramuli.

CHYLOCLADIA OVALIS.—OVAL-LEAFED CHYLOCLADIA.

Fronds two to ten inches high, naked below,

cylindrical, branched in an irregular forked manner with elliptical and usually simple ramuli, either lanceolate or oval, clustered or scattered on the branches, filled with a jelly-like fluid, which causes them to adhere well to paper, while the stems are hard and rigid, adhering but slightly. Darker in colour than others of the genus. Grows on rocks and other algæ. Annual. June to August. Frequent on the shores of England and Ireland.

CHYLOCLADIA KALIFORMIS.—SALTWORT CHYLOCLADIA.

Fronds tufted, from four to twelve, or even eighteen inches in length. Stem contracted at distant intervals, as if jointed; branches springing from the contractions in whorls, as do the ramuli; these are closely contracted, which gives them a beaded appearance. Colour, dull purplish-red, staining the paper on which it is dried a bright red. Substance tender, and adhering well to

paper. Grows on rocks and other algæ. Annual. June to September. Frequent on the coasts of England, Scotland, and Ireland.

CHYLOCLADIA REFLEXA.—ARCHED CHYLOCLADIA.

From two to three inches high, distinguished from all other species by the small root-like processes which arise from the curved lower branches; these are furnished at the tips with disks, by which they adhere to surrounding objects. The secondary branches mostly secund, simple, arising from the upper side of the arched ones; ramuli few, scattered, regularly constricted into joints in the upper branches, scarcely constricted in the lower ones. Colour, a dull purple. Substance membranaceous, adhering to paper. Grows on rocks near low-water mark. Annual. Summer and Autumn. Very rare. Discovered at Hagington, near Ilfracombe, by Miss Amelia Griffiths. "The Irish station given in Phyc. Brit. is incorrect." In a

letter from Mrs. Griffiths, she informs me that, in March, 1850, she had received young plants of C. reflexa from Plymouth. I am also enabled to add another station on the authority of W. P. Cocks, Esq., of Falmouth, who has found it there, "attached to rock, extreme low water-mark, due south of the Rev. Mr. Coope's house." From Exmouth, Mrs. Gulson has sent me specimens, with both kinds of fruit. The examples from this locality, Dr. Harvey says, are the finest he has seen in Britain.

CHYLOCLADIA PARVULA.—SMALLER, SALTWORT CHYLOCLADIA.

From two to three inches, densely tufted, and much branched in a straggling manner, constricted at intervals of equal length and breadth. May be known from C. kaliformis by its uniformly shorter joints and smaller size, as well as in its branching and in the shape of the capsules; in the former they are spherical, in this ovate. Substance

soft. Colour, a pinky red. Parasitical on the smaller algæ, on most parts of our coasts, growing in tide-pools near low water-mark.

CHYLOCLADIA ARTICULATA.—JOINTED CORALLINE-LIKE CHYLOCLADIA.

Fronds arising from a mass of fibres, tufted from one to six, and sometimes twelve inches long. The contractions strongly marked throughout; branches springing in a forked manner; ramuli either opposite or whorled. Colour, pale red purple, transparent. Substance membranaceous. Grows between tide-marks, on rocks, and the larger algæ. Annual. Summer. Frequent.

CORALLINACEÆ.—CORALLINE TRIBE.

"Rigid, articulated, or crustaceous, mostly calcareous sea-weeds, purple when recent, fading on exposure to milk-white, composed of closely packed, elongated cells or filaments, in which carbonate of

lime is deposited in an organized form. *Tetraspores* tufted, contained in ovate or spherical *conceptacles* (*ceramidia*), furnished with a terminal pore."

Until lately these stone-encrusted sea-weeds were associated with the Zoophytes and Corals, productions to which they show a remarkable resemblance in outward form; but when the coating of lime is removed from their fronds by means of acid, their vegetable nature at once becomes apparent; and in structure they will be seen to resemble, as well as in their fructification, other plants of the red series. On the shores of tropical countries we learn they are among the most beautiful of marine plants; the shores of Australia are peculiarly rich in them, some forming fans like our Padina, but rose-coloured; others triply pinnate, like Callithamnion; others with whorled ramuli, like the Charæ of our ditches. On our coasts this species are not remarkable for their beauty; the very commonest kind of the articulated species is the Corallina officinalis, which grows abundantly in pools on

the shore; when fresh it is of a reddish purple, or salmon coloured; the root—if so it may be termed—is a wide, flattened crust, from which spring the articulated pinnate fronds. In the sub-order of the Nulliporæ, the fronds form lichen-like crusts on rocks, stones, &c., and on the stems of algæ; and the fruit appears in little protuberances on the surface. The different species, or, perhaps more correctly, varieties of form in this genus it is not easy to separate from one another. According to Dr. Harvey, most of the thick, nulliporous crust found between tide-marks should be referred to Melobesia polymorpha; and Dr. Johnston considers all the species as only ill-developed forms of Corallina officinalis. "It appears first," he says, "in the guise of a thin, circular, calcareous patch of a purplish colour, and in this state is common on almost every object that grows between tide-marks. When developing on the leaves of *Zostera*, or in other unfavourable sites, these patches are usually pulvurulent and ill-coloured, green or white, and never becoming large; but

in suitable situations, they continue enlarging in concentric circles, each marked with a pale zone, until they ultimately cover a space of several inches in diameter. The resemblance, in this condition, which the crust has to some crustaceous fungi, more especially to *Polyporus versicolor*, is remarkably exact; and neither is it less variable than the fungus in its growth, the variations depending on the nature of the site from which it grows. If this is smooth and even, the foliaceous coralline is entirely adnate and also even; but if the surface of the site is uneven or knotted, the coralline assumes the same character. If it grows from the edge of a rock, or on the frond of a narrow sea-weed, or from a branch of the perfect coralline, the basal laminæ spread beyond in overlapping imbrications of considerable neatness and beauty. They are semicircular, wavy, either smooth or studded with scattered granules, and these granules (ceramidia) may be either solid or perforated on the top. Such states of the coralline have been described as *Millepora lichenoides;*

while its earlier states constitute Lamouroux's various species of *Melobesia*." To observe the internal structure of the Corallines, it is necessary to macerate a portion in weak acid until the calcareous matter be removed. In drying they require but very little pressure. The plant figured under the name of *Lithocystis Allmanni* in the Phyc. Brit., is now ascertained to be identical with the *Hapalidium Phyllactidium* of Kützing.

GENERA OF THE CORALLINE TRIBE.

Sub-order of the Corallineæ. Frond filiform, articulated.

Coralline. Frond pinnated. *Ceramidia* terminal, simple.

Jania. Frond dichotomous. *Ceramidia* tipped with two horn-like ramuli.

Sub-order. Nulliporeæ. Frond crustaceous or foliaceous, opaque, not articulated.

Melobesia. Frond stony, forming either a crustaceous expansion, or a foliaceous or shrub-like body.

Hildenbrandtia. Frond cartilaginous, not stony, forming a crustaceous expansion.

Hapalidium. Frond plane, transparent, composed of cells radiating from a centre.

CORALLINA.

Named from Coralium, coral, which these plants resemble.

Frond filiform, articulated, branched (mostly pinnate) coated with a calcareous deposit. *Fructification,* turbinate or obovate, mostly terminal; *ceramidia,* pierced at the apex by a minute pore, and containing a tuft of erect, pear-shaped, or club-shaped, transversely parted tetraspores.

CORALLINA OFFICINALIS.—COMMON CORALLINE.

This is an exceedingly abundant species, growing in rocky pools; the colour, when fresh, is a dull purple, soon becoming white on exposure to the atmosphere. From two to six inches high, arising

in tufts from the crustaceous root, when luxuriant the branches are variously pinnate. The ceramidia are either urn-shaped, and terminating the branches and ramuli, or occasionally lateral ovate ceramidia of smaller size are produced on various parts of the articulations, and so densely crowded, as to cover the whole articulation. Perennial. Winter and Spring.

O. S. C. elongata. Coast of Cornwall, Ellis. Jersey, Mr. Hassall. Attached by a crustaceous base, three or four inches high, ultimate branches almost hair-like, with cylindrical articulations, C. squamata. Grows on submarine rocks at low water-mark. Perennial. Summer. South coast of England. Abundant at Miltown Malbay, West of Ireland. Youghal. Jersey. "This has the habit of *C. officinalis*, but differs in the form of the upper articulations, which are here much compressed, with the angles sharp and prominent."

JANIA.

Named from Janira, one of the Nereides.

Frond filiform, articulated, dichotomous, branched, coated with a calcareous deposit. Fructification, urn-shaped; *ceramidia*, formed of the axillary articulation of the uppermost branches (mostly two-horned), containing tetraspores.

JANIA RUBENS.—RED JANIA.

Grows in tufts of half-an-inch to two inches in height, on the smaller algæ between tide-marks. Branches slender, repeatedly forked. "Articulations cylindrical in all parts of the frond, without prominent angles; those near the base very short, the upper ones gradually longer." Ceramidia urn-shaped with long horns. The colour is a pale red, with purplish shades when quite fresh. Perennial. Summer. Common.

O. S. *G. corniculata.* Grows on the smaller

algæ between tide-marks. Southern shores of England and Ireland. Jersey. Differs from the foregoing in the shape of the articulations of the principal branches, which are compressed, with their upper angles sharp and prominent. The colour is a pale red.

MELOBESIA.

Named from one of the sea-nymphs of Hesiod.

Frond attached or free, either flattened, orbicular, pinnated or irregularly lobed, or cylindrical and branched (never articulated), coated with a calcareous deposit. Fructification, conical, sessile; *ceramidia*, scattered over the surface of the frond.

MESOGLOIA POLYMORPHA.

Frond attached to rocks, stones, shells, &c., between tide-marks; thick, stony, encrusting, or rising into short clumsy branches, which are seldom much divided, and often merely rudimentary. Perennial. Common.

MELOBESIA CALCAREA.—CHALKY MELOBESIA.

When recent, it is a deep blood-red, soon passing into brick-dust colour, and finally to a snowy whiteness. The branches are slender, divaricating, spreading in all directions, anastomosing below, free above, and tapering to a blunt point. The ultimate ramuli are either simple or forked. On many parts of our coast this plant forms vast beds, extending for miles in submarine strata; and is advantageously used on soils requiring the addition of lime." Harv. Man. ed. 2nd, p. 108. In four to ten fathoms water. Common on the south of England, and west of Scotland and Ireland.

O. S. *M. fasciculata.* In four to five fathoms water, lying at the sandy bottom of the sea. Found on several parts of the coast. Colour when recent a livid purple, soon fading to a dirty white; one to three inches in diameter, roundish or irregularly lobed, stony, with short, thick, solid branches.

M. agariciformis. Lying on the sandy bottom of quiet bays, in two to three fathoms water. Roundstone Bay, Cunnemara. Globular, hollow, foliations delicate. "The *colour* when recent is more or less tinged with a rosy pink; when dry it fades to a yellowish white, and when exposed to the sun becomes perfectly white and rapidly crumbles to powder."

M. lichenoides. On rocks in tide-pools, near low water-mark. Not uncommon. Perennial. Detached at the margins of the lobes, spreading over rocks, and resembling the leafy lichens. Some varieties of this plant are at times so much like small examples of the former species, that, according to Dr. Harvey, the difference in habit may be caused by the different depths at which these plants vegetate.

M. membranacea. Common on the leaves of *Zostera,* the fronds of *Chondrus crispus,* &c. Annual. Summer. Minute, dot-like, very thin, and almost membranaceous. Ceramidia, one or two, depressed. Pale purple.

M. farinosa. "On various algæ. Rather larger and thicker than the preceding, with more prominent fruit, but to me it appears merely a stronger-grown variety." *Harv.*

M. verrucata. "Grows on the fronds of *Phyllophora rubens*, &c. Dotted over innumerable small, pimply ceramidia. Looks like a still more advanced state of *M. membranacea.*"

M. pustululata. Grows on *Phyll. rubens*, *Chon. crispus*, &c. "This is the largest and most developed of this parasitic section, and, perhaps, without much violence, the preceding species might be considered as merely younger and imperfect forms." *Harv.* Thick, dull purple or green. *Ceramidia* numerous, large, rather prominent, conical.

HILDENBRANDTIA.

Frond cartilagineo-membranaceous (not *stony*), crustaceous; sub-orbicular, adhering by its lower

surface; composed of very slender, closely-packed vertical filaments. *Conceptacles* immersed in the frond, orbicular, depressed, containing tetraspores.

HILDENBRANDTIA RUBRA.—RED HILDENBRANDTIA.

"On smooth stones and pebbles between tide-marks, and in deep water. Common. Forms a thin, membranous crust; at first orbicular, and spreading concentrically; at last irregular in form, following the sinuosities of any body to which it may be attached. A small portion, viewed vertically under the microscope, shows minute cells lying in a clear jelly. When in fruit the surface is pitted with disk-like depressions, pierced by a hole which communicates with a chamber in which the spores lie. *Colour* variable; now a bright, now a dull red." Harv. Man. 2nd Ed. p. 110.

HAPALIDIUM.

" Plant calcareous, consisting of a single plane of cellules, which are disposed in radiating dichotomous series, forming an oppressed, flabelliform frond." Allman.

HAPALIDIUM PHYLLACTIDIUM.—WHITE HAPALIDIUM.

Forms minute, dot-like patches of a whitish colour on algæ. Common. " Each dot consists of one or several fan-shaped fronds, composed of quadrate cells, disposed in dichotomous series. The plant is brittle, colourless, and effervesces in acid." Described, in the *Phycologia Britannica*, under the name of Lithocystis Allmanni, and the figure of it in that work represents the young plant, which at a later period becomes much more more lobed and expanded.

DELESSERIACEÆ.—DELESSERIA TRIBE.

Rosy, purplish-red or blood-red sea-weeds, with a leafy, or rarely filiform, areolated, inarticulate frond, composed of polygonal cells. *Leaves* delicately membranaceous. *Fructification* double; 1. *Conceptacles* (*coccidiæ*), external, or partly immersed, containing spores; 2. *Tetraspores*, in distinctly defined *sori*, either scattered through the frond or placed in proper fruit-leaflets or *sporophylla*.

This, though a small, is a strikingly beautiful tribe; containing the Delesseria, with perfect leaf-like fronds of a rose-red colour, and the paler and more delicate Nitophylla,

> "How their blushes speak
> Of rosy hues that bright o'er ocean break,
> When cloudy morn is calm, yet fain to weep,
> Because the beautiful is still the frail."

Fortunately for the botanist, though they soon lose their colour when exposed to the sun and air,

when once dried they preserve their rich tints unaltered for a length of time. The genus Nitophyllum is distinguished from Delesseria by its being without a midrib, which is usually very distinct in the latter. Plocamium coccineum, a well known feathery plant, common on our shores, and found in all cool waters extending, according to Dr. Harvey, within some 34° of the line in both hemispheres, is the only British filiform species of the tribe; other species of the genus Plocamium are natives chiefly of the shores of South Africa, and New Holland.

GENERA OF THE DELESSERIA TRIBE.

Delesseria. Frond leaf-like of definite form, with a midrib running through it.

Nitophyllum. Frond without a midrib, delicate, expanded; sometimes marked with vague veins.

Plocamium. Frond linear, or filiform; much branched; distichous. Ramuli secund.

DELESSERIA.

Named in honour of M. Benj. Delessert, a distinguished French Naturalist and patron of Botany.

Frond rose-red, flat, membranaceous, with a percurrent midrib. *Fructification* of two kinds, on distinct individuals:—1. Hemispherical *tubercles* (coccidia), mostly on the midrib, containing a tuft of filaments bearing the spores. 2. *Tetraspores* forming definite spots in the frond, or in distinct leaf-like processes.

DELESSERIA SANGUINEA.—RED DOCK-LEAVED DELESSERIA.

Stem cartilaginous, bearing beautiful, large, rich rose-red fronds, in shape and colour like the leaves of the Red Dock (Rumex sanguineus), and veined like those of the Spanish chestnut. In the summer the fronds are large, and with a waved margin, smaller leaves often springing from the midrib as the season advances. The winter state presents a remarkable contrast, the membranaceous

part of the fronds decays, and there remains alone the naked stem, which then bears the fructification, either in *tubercles* on little stalks, or *tetraspores* produced in little leaf-like bodies. A variety of this plant is sometimes found with lobed leaves; the midrib divides near the tip, in the specimens I have seen at Minehead, on the Somerset coast, and the leaf, in consequence, becomes bifid at the extremity. The lobed variety gathered by Dr. Landsborough on the Ayrshire coast, is a very curious form; according to Dr. Harvey, showing a tendency towards D. sinuosa in form, from which, in colour and other characters, it widely differs. Substance, delicate; adhering firmly to paper. Grows in deep rock-pools, between tide-marks, generally at the shady side of the pool, under projecting ledges of rock. Common on the British coasts from Orkney to Cornwall. Biennial. Very large in the Scilly Isles, and at Falmouth. In a specimen which I procured from Gwyllyn Vase Bay, near there, the fronds are nearly ten inches in length.

DELESSERIA SINUOSA.—OAK-LEAVED DELESSERIA.

Fronds irregular in their outline, jagged, with a clear, well-defined midrib. Colour, claret-red; not so bright as the preceding, nor does it adhere to paper so firmly. The *tubercles* are embedded in the midrib of the leafy lobes; *tetraspores* in minute slender processes fringing the margin. Grows frequently on the stems of *L. digitata*, likewise attached to various substances in deep water, and vegetates at a depth varying from six to ten fathoms. Perennial. Summer and autumn. Common on the British shores.

DELESSERIA ALATA.—WINGED DELESSERIA.

Stem somewhat forked, and much branched. Fronds not in a leaf-like form, but continuing along each side of the branches. *Tubercles* attached to

the midrib, usually near the ends of the branches. *Tetraspores* either in proliferous leaflets, or in the tips of the fronds. Colour, a dark red. Substance in the stems and old plants firm, more tender in summer than in winter. Grows on rocks and the larger algæ between tide-marks, and in four to ten fathoms water. Biennial.

DELESSERIA ANGUSTISSIMA.—NARROW DELESSERIA.

Frond compressed, very narrow, without any membrane; very nearly approaching to the above, and not considered distinct from it by Dr. Harvey, but admitted by him into his works in deference to the opinion of Mrs. Griffiths, who reckons it a separate species. The *extreme* narrowness of frond and entire suppression of the winged membrane constitute the chief distinctions between this plant and D. alata. Grows on the stems of *Laminaria digitata*. Perennial. Winter and spring. Scar-

borough. Coast of Cornwall. Aberdeen. Lossiemouth, Morayshire. Orkney. Galway. Kingstown.

DELESSERIA HYPOGLOSSUM.—PROLIFEROUS DELESSERIA.

Fronds lance-shaped with a midrib, from which arises a second series, resembling the first, and bearing in the same manner another set of leaves. Tufted, four to six inches high; sometimes the first leaf is very narrow, not more than a line in breadth, and seldom more than two. In specimens gathered at Bantry Bay by Miss Hutchins, of very large size, the primary leaf is six to eight inches long, and half an inch wide. *Tubercles* globose, on the midrib, about the centre of the leaflet; *tetraspores* in linear lines or spots at each side the midrib, often near its end. Substance thin and delicate, adhering well to paper. Colour, a pinky-red, soon given out to fresh water. Grows on rocks and other algæ.

Annual. Summer. Not uncommon on the shores of England and Ireland; rare in Scotland.

DELESSERIA RUSCIFOLIA.—BOX-LEAVED DELESSERIA.

Not unlike the last species, but smaller, with rounder, wider, and shorter fronds. The colour is deeper, and the substance rather firmer; tetraspores forming an oblong line on each side the midrib. Grows on rocks, algæ, &c. Annual. Summer and Autumn. Rather rare. Shores of England and Ireland. Yarmouth. Coasts of Devon and Cornwall.

NITOPHYLLUM.

Name meaning a *shining leaf.*

Frond reticulated, delicately membranaceous, generally rose-coloured, wholly without veins, or with slight vague ones towards the base. Fructifica-

tion : 1. raised *tubercles* (coccidia), sessile on the frond containing spores ; 2. *tetraspores* forming distinct scattered spots.

NITOPHYLLUM PUNCTATUM.—DOTTED NITOPHYLLUM.

Substance of the frond in this species exceedingly thin and delicate, entirely without veins. At first the frond is broadly wedge-shaped, afterwards it is regularly divided into forked segments, which still preserve their wedge-shaped outline; in the variety β *ocellatum* the frond is cleft nearly to the base with narrow, and many and regularly divided segments. The spots of *tetraspores* form either round, oblong, or linear dots of large size scattered over the whole frond, or confined to its divisions; *tubercles* globose, and thickly distributed over the surface. Grows attached to various algæ between and beyond tide-marks. Annual. Summer. "The usual size of this plant is from four to twelve inches long, and about as broad,

but in favourable situations much larger; and in some gigantic specimens gathered by Mr. D. Moore, at Cushendall Bay, North of Ireland, five feet long and three feet wide." Roundstone Bay, Galway, abundant. Bantry Bay. Larne. Torquay. Sidmouth. Mount's Bay, Cornwall. Swansea. β *ocellatum*, Coast of Moray. γ *crispatum*, Kilkee and Roundstone, West of Ireland. Mount Batten, Plymouth. δ Pollexfenii, Orkney. ε *fimbriatum*, Roundstone Bay, Galway.

NITOPHYLLUM HILLIÆ.—HILL'S NITOPHYLLUM.

Frond from four to eight inches long, of a fine rose-red colour, faintly veined at the base, rising from a short stem, usually of a broad fan-shaped figure slightly cleft or lobed, the veining sometimes extends over the greater portion of the frond; the substance is thickish, but tender, resembling, says Mrs. Griffiths, "soft kid leather." *Tubercles* scattered over the surface, very evident. Spots

of *tetraspores* minute, abundantly distributed over the fronds. The smell, when fresh, is said to be extremely disagreeable and peculiar. Grows on rocks, &c. near low water-mark; rare. Annual. July to October. First found by the late Miss Hill at Plymouth. Torquay. Falmouth, Mr. W. P. Cocks. Mount's Bay. Whitsand Bay. Scilly Isles. Jersey. Bantry Bay. Valentia, West of Ireland. Coast of Moray.

NITOPHYLLUM BONNEMAISONI.—BONNEMAISON'S NITOPHYLLUM.

Frond from two to four inches long, with a short stem, either fan-shaped or palmate, divided into wedge-shaped segments, marked at the base with faint veins. In substance thin and delicate, adhering firmly to paper. Colour a rose-red. "*Tubercles* scattered over the frond; spots of *tetraspores* smaller than in *N. punctatum*, larger than in N. Hilliæ, scattered over the surface and segments." Grows on the stems of

Laminaria digitata. Rare. Annual. Summer and Autumn. Torquay. Falmouth Bay, Miss Warren, "very rarely." Ilfracombe. Minehead, Somerset, occasionally cast ashore, I. G. Larne. Youghal. Tramore. Miltown Malbay. Bute. Orkney.

NITOPHYLLUM GMELINI.—GMELIN'S NITOPHYLLUM.

Frond two to four inches in breadth, with a short stem, more or less fan-shaped, with a roundish outline marked by veins, very evident in some specimens, and less so in others; "the margin smooth and even," the plants which I find on the Minehead beach are very much jagged at the margin, and the divisions lengthened out into narrow-pointed segments. Colour, a purplish red. Substance membranaceous, rather crisp when first gathered. *Tubercles* scattered over the surface: spots of *tetraspores* confined to the margin of the frond, *long* and *linear.* Grows on rocks and *Laminariæ*, &c. Rare. Annual. Summer. Coast

of Devon. Whitsand Bay, near Plymouth. Falmouth Bay, "very rarely." Ilfracombe. Minehead, Somerset: not unfrequently cast ashore there; I. G. Bantry Bay. Kilkee. Several stations on the north-east coast of Ireland.

NITOPHYLLUM LACERATUM.—TORN NITOPHYLLUM.

Fronds from two to ten inches long, very much divided, forked into variously cleft segments often ciliated at the margin, and marked with veins running through the frond. When in the water it appears of a silvery hue. When dry the colour is nearly the same as that of *N. Gmelini*. *Tubercles* scattered; *tetraspores* in *oblong* spots along the margin, or in distinct leafy processes. In the variety *β uncinatum* the fronds are very narrow, with the tips hooked into the form of a sickle. Grows on various algæ, common. Annual. Summer.

NITOPHYLLUM VERSICOLOR.—PINK AND ORANGE NITOPHYLLUM.

Stem stiff, twig-like, half an inch to an inch high; either branched or simple, bearing broadly fan-shaped, regularly cleft fronds; whole plant with a rounded outline, margin entire, excepting in old plants, when the tips of the segments become greatly thickened, and eventually fringed with colourless, hair-like cilia; these hardened substances, on dissection, Mrs. Griffiths finds to be full of minute grains. In the base of the frond at its juncture with the stem a similar thickening is often perceptible. The fructification in this species is unknown. I have examined many dozens of specimens in every stage of growth, in the hope of detecting it, but without success. When fully grown, in August, the callous tips form a very peculiar feature in this plant; and in its younger state, it may always be known from *N. Bonnemaisoni*, which it nearly resembles, by its rapidly changing from rose-red to a beautiful orange,

when placed in fresh water. I have remarked that when the water first comes in contact with the frond it immediately loses its crispness, hissing and crackling like slackened lime, giving out at the time a peculiar strong and pungent odour, which makes the eyes smart.

Not noticed on any other shores than those of England and Ireland, neither has it ever been procured in a growing state: its place of growth is probably in deep water. June to August. Ilfracombe. Minehead, Somerset; I. G. Not uncommon during the above months, and frequently cast ashore in a fresh state. Youghal.

PLOCAMIUM.

Name meaning *intertwined hair*, in allusion to the finely branched fronds.

Frond pinky-red, linear, compressed or flat, ribless, or faintly-nerved, cellular, distichously much branched; the ramuli alternate or secund, acute. Fructification: 1. Spherical *tubercles (coccidia)*,

sessile or stalked, marginal or axillary, containing spores. 2. Lateral or axillary, simple or branched *pods (stichidia)*, containing transversely parted tetraspores.

PLOCAMIUM COCCINEUM.—SCARLET PLOCAMIUM.

A beautiful and very common sea-plant, with much branched and feathery fronds, the lesser ramuli furnished on their inner side with comb-like divisions. *Tubercles* sessile on the edge of the upper branches, each one about the size and colour of a poppy-seed; *tetraspores* contained in small cross-like receptacles borne on the ramuli. Colour a fine pinky red. Substance not at all flaccid, and though so delicate in its branchings, it is a very easy species to spread out, only requiring to be laid in a plate with sufficient water to float the branches, which, with the help of a camel-hair pencil, will soon fall in their natural and therefore most elegant position. Frequent on rocks and algæ. Perennial. Summer and autumn.

PLOCAMIUM COCCINEUM

RHODYMENIACEÆ.—RHODYMENIA TRIBE.

Sea-weeds of a brown-red, purplish or blood-red colour, with flat or filiform inarticulate fronds, surface cells minute, rarely disposed in filaments. Fructification of two kinds. 1. Conceptacles (*coccidia*) external or partly immersed, containing a mass of spores. 2. Tetraspores dispersed through the whole frond, or collected in indefinite cloudy patches.

The leafy plants of this tribe are thicker in texture than those of the preceding. Rhodymenia bifida, however, is nearly as delicate as a Nitophyllum, and in the absence of fruit, may possibly be mistaken for N. Gmelini; when viewed through the microscope, the structure appears much closer and denser than in that genus. In the Stenogramme interrupta the tetraspores form round, *clearly defined* sori: these I first noticed on Minehead plants in 1848, but it is not until recently that specimens have

been found with this kind of fructification in any other locality. I am informed by Mr. Hore that he has in his possession "a portion of a single plant dredged in Cork Harbour in advanced tetrasporic fruit, in 1851. A similar specimen from Lisbon. Two magnificent specimens from New Zealand: one tetrasporic, six inches in length, the other with tubercles filling a piece of paper $8\frac{1}{2}$ inches by 7!" At the time that Dr. Harvey included the genus Stenogramme in this tribe, the secondary fruit was unknown, and as one of the distinctions between the Delesseria and Rhodymenia tribes consists in the tetraspores in the latter never being collected into well-defined sori, it would appear that Stenogramme should now be removed from hence.* The structure of the outer stratum of cells in Gracilaria shows an approach to Crytonemiaceæ, in which the cells are connected together into fibres, and form a

* Since writing the above, I have been informed by Dr. Harvey that he removes this genus, though not without doubt, to the neighbourhood of Phyllophora, while Professor Agardh leaves it doubtfully (knowing the tetrasporic fruit) in the Rhodymeniaceæ.

frond of a greater or less degree of thickness. In the East several species of this genus are made into jelly, and Mrs. Griffiths once prepared from G. compressa a pickle and preserve which proved, we are told, "excellent in flavour as well as ornamental;" it is, unfortunately, one of our rarest species; and M. Soyer will never be able to employ his culinary skill in its favour, as he has done with the well-known *Dulse* R. palmata of this tribe.

GENERA OF THE RHODYMENIA TRIBE.

Stenogramme. "Conceptacles linear, rib-like." Tetraspores collected into dense, oval, *well-defined sori.*

Rhodymenia. Tubercles convex, scattered. Frond flat.

Sphærococcus. Frond linear, compressed, distichously branched.

Gracilaria. "Frond filiform, compressed or flat, irregularly branched; the central cells very large."

Hypnea. "Frond filiform, irregularly branched, traversed by a fibro-cellular axis."

STENOGRAMME.

Name meaning a *narrow line*, in allusion to the linear fructification.

"*Frond* rose-red, leaf-like, nerveless, laciniate, cellular; the central cells large, transparent, in several rows; those next the surface, minute, coloured, closely packed. *Fructification:* 1. linear, convex, longitudinal (nervelike), conceptacles, containing a dense mass of minute spores." *Harv.*; 2. *tetraspores* very minute, densely packed together, tripartite (?), contained in oval, opaque dark-coloured spots (*sori*) scattered over the frond.

STENOGRAMME INTERRUPTA.—RIB-FRUITED STENOGRAMME.

Root a small round disk, not larger than a pin's

head. Frond from two to six inches high, narrow at the base, then widening, and soon dividing in a palmate manner, regularly forked, the tips of the segments notched and rounded. When producing spores, the centre of each division becomes thickened into a raised line resembling a midrib, but not continuous through the frond, generally breaking off opposite a forking; the tetraspores which I discovered on Minehead specimens in 1848, form round, conspicuous, well-defined spots (*sori*) scattered over the frond nearly of the same size and shape as the spots of tetraspores in *Chondrus crispus*. The colour in Minehead plants is very like that of *Rhodymenia laciniata*, while the substance and feel of the frond more nearly resembles young plants of *R. palmata*. It adheres but imperfectly to paper. Plymouth specimens which I have seen are more fan-shaped than mine, and the texture appears thinner, and colour a lighter red. On this beach I find it floated ashore from June to the end of December, and even as late as March I have collected specimens. From August to

December, plants with both kinds of fruit are thrown up. Specimens with tetraspores have not been collected at Plymouth.

Grows in deep water on shells, &c., in muddy harbours and estuaries. Discovered in 1847 by Dr. John Cocks at Bovisand, near Plymouth, and at Mount Edgecombe a few days later by the Rev. W. S. Hore. Minehead, Somerset, August, 1848, noticed the tetraspores on October plants; I. G. A single plant with tetrasporic fruit dredged in Cork Harbour by Mr. Carroll, 1851.

RHODYMENIA.

Name signifying *red membrane.*

Frond flat, membranaceous or slightly leathery, quite ribless and veinless, cellular. *Fructification*: 1, convex *tubercles* (*coccidia*) containing minute spores; 2, *tetraspores* either scattered or forming cloudy patches.

RHODYMENIA BIFIDA.—THIN-CLEFT RHODYMENIA.

Fronds tufted one or two inches high, irregularly cleft, thin and transparent. Colour a pink or brownish red. Tubercles usually confined to the margin. Tetraspores forming cloudy spots on the upper part of the frond. "Var. *β ciliata:* frond somewhat thicker than usual, opaque, brownish red, narrow, much divided; the margins fringed with leafy cilia."—*Harv.* Grows attached to rocks and algæ. Annual. Summer. Frequent on the southern shores of England and Ireland. Rare in Scotland. Ardrossan. Saltcoats. Kilbride. Whitburn and Tynemouth. Jersey. *β ciliata,* Belfast Bay. Carrickfergus.

RHODYMENIA LACINIATA.—THICK-CLEFT RHODYMENIA.

Frond rather thick cleft in more or less of a palmate or fan-shaped form, the segments

slightly forked. Substance firm, opaque, but adhering well to paper. Colour a bright red. This plant is often fringed along the margin with minute processes (*cilia*), in which the tubercles are contained. Tetraspores form cloudy spots close to the margin. Grows commonly on rocks and stones in deep water. Biennial. Fruiting from January to July.

RHODYMENIA PALMETTA.—PALM-LIKE RHODYMENIA.

This species has fan-shaped fronds, more or less divided and forked, with a cylindrical stem. The var. *Nicæensis* rises from creeping fibres and bears a narrow forked frond, very much resembling Phyllophora Palmettoides. Colour a pinky red, when young, dull in old plants. Substance firm, not adhering to paper. Tubercles usually near the tips of the frond. Tetraspores in cloudy spots on the expanded tips of the segments. Not unfre-

quent on rocks and the stems of *L. digitata*. Annual. Summer and autumn.

RHODYMENIA CRISTATA.—TUFTED RHODYMENIA.

"Frond semicircular, membranaceous, sub-dichotomous, the segments somewhat dilated upwards, repeatedly subdivided, the divisions alternate, decurrent, laciniate at the ends; tubercles spherical, imbedded in the margin of the frond. Colour a rose-red, nearly similar to that of Delesseria Alata." —*Grev. Alg.* A northern species rarely found on our shores. Parasitical on *L. digitata*. Annual. July. Wick, Caithness. Frith of Forth. Berwick. Shetland. Orkney.

RHODYMENIA CILIATA.—FRINGED RHODYMENIA.

Frond shaped like a leaf, oblong, or lanceolate, from two to four inches long, serrate or jagged at

the margin, eventually the cilia become lengthened nto various-shaped lobes, which are again ciliate at their margins; the tubercles are placed on these cilia, and the tetraspores are in cloudy spots over the surface. Root creeping, composed of fibres. Substance thick and rigid. This species requires to be soaked for some little time in water before submitting to pressure, or the paper on which it is preserved will be stained of a dark brown hue. Colour a brownish red. Attached to rocks and stones near low water mark, and at a greater depth. Annual. Bears fruit in winter.

RHODYMENIA JUBATA.—JAGGED RHODYMENIA.

A variable plant very like the preceding, but may be known from it by its brighter colour, softer and more flaccid substance, also in the different position of the tetraspores, which, in this, are confined to the cilia. Sometimes the fronds are very

narrow, and the cilia much drawn out, cylindrical and branched. Several fronds arise from the fibrous root. Annual. Fruits in summer, while *R. ciliata* produces its fruit in winter. Grows on rocky or gravelly shores in tide pools. Frequent.

RHODYMENIA PALMATA.—HAND-SHAPED RHODYMENIA.

Fronds from two to twenty inches long, broadly wedge-shaped, divided in a palmate manner, or narrow and forked, in some forms cleft into very narrow finely-divided segments. Tetraspores in cloud-like spots, spread over the whole surface of the frond. Substance tender when young, but afterwards thick and leathery. The following well-marked varieties are enumerated in the *Phycologia Britannica*:—*β marginifera*; frond oblong, sub-simple, proliferous at the margin. *γ simplex*; frond undivided, wedge-shaped. These two forms grow on the stems of *L. digitata*. *δ Sarniensis*; frond laciniated, the segments narrow and sub-linear. *ε sobolifera*;

frond stipitate, membranaceous, the branches very narrow below, much divided, expanding upwards into wedge-shaped and laciniate lobes. Grows on Fucus serratus. R. palmata is the *Dulse* of Northumberland and Scotland, and *Dillisk* of the Irish. In Scotland and Ireland it is much eaten by the poor, usually raw, more rarely boiled or fried; the smaller varieties growing on rocks are preferred, as being less leathery in texture and sweeter in taste. In M. Soyer's "St. Patrick's Soup," one of the soups invented by him for the starving Irish, it forms the principal ingredient; and it is often used in the Mediterranean for colouring and flavouring made dishes. When the dried frond is steeped in water it exhales a violet scent. Very common on rocks, and stems of the Laminariæ.

SPHÆROCOCCUS.

Name signifying *sphere-shaped* fruit.

Frond cartilaginous, compressed, two-edged, linear, distichously branched. *Fructification;*

spherical *tubercles (coccidia)* containing a mass of minute spores.

SPHÆROCOCCUS CORONOPIFOLIUS.—FRINGED SPHÆROCOCCUS.

Fronds much branched, from six to twelve inches high, spreading, feathery, upper branches forked, often fringed with small processes in which the tubercles are placed. Colour scarlet, darker in the main stem. Substance rather stiff, horny, when dried, and not adhering well to paper. On rocky shores near low water-mark and beyond. Biennial. Summer and autumn. Not uncommon on southern shores of England, and western and southern coasts of Ireland. Belfast. Very rare in Scotland, Bute.

GRACILARIA.*

Named after *gracilis*, slender.

Frond filiform, or rarely flat, carnoso-cartilagi-

* It is to be regretted that this name is also applied to a genera of insects.

nous, continuous, cellular; the central cells large, those of the surface minute. *Fructification;* 1. convex *tubercles* (*coccidia*) containing minute spores; 2. *tetraspores* imbedded in the surface cells.

GRACILARIA CONFERVOIDES.—FILIFORM GRACILARIA.

Fronds from three to twenty inches high, cylindrical, cartilaginous, forked, more or less set with slender ramuli, tapering upwards. The tubercles are large and very common, forming one of the most conspicuous characters in this species. Colour a deep red. Rigid in substance, and not adhering to paper. Tetraspores minute, imbedded in the branches. Grows in sandy tide-pools, not unfrequent. Perennial. Produces fruit in summer and autumn. There are three varieties of this plant: viz.—β *procerrima*, with long, generally simple and naked branches; γ *albida*, frond compressed, mostly dichotomous, ramuli awl-shaped; δ *genicu-*

lata, the frond distorted and bent, as if broken at the tubercles.

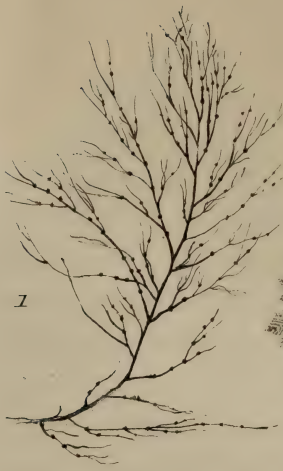
O. S. G. multipartita. Grows on rocks or stones in muddy places, chiefly estuaries; near low water, and at a greater depth. Very rare. Annual. August and September. Coast of Devon; dredged in Salcombe Bay. Shore under Tait's Hill, Plymouth. In the Sound and Whitsand Bay, near Plymouth.

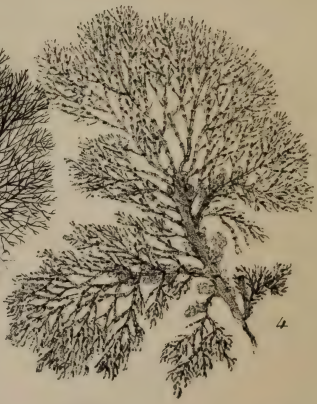
"Frond flat, tender, semi-transparent, brittle, dull purplish-red, deeply cleft in an irregularly dichotomous or palmate manner; the branches linear, wedge-shaped; apices acute; tubercles conical, very prominent, scattered over the segments." —*Phyc. Brit.* The frond in this is flat, variable in breadth, and from four to twelve inches long; in aspect it very much resembles some of the Rhodymenia, but may be known by its very prominent tubercles.

G. compressa. Thrown up from deep water. Very rare. Sidmouth, Mrs. Griffiths. Exmouth, Mrs. Gulson. Jersey, Miss Turner. Annual. August.

"This plant," says Dr. Harvey, "has something the aspect of *G. confervoides*, but may always be known by its more succulent frond and very different substance. It is as soft and brittle as *G. confervoides* is hard and tenacious. It also bears some resemblance to the narrow variety of *G. multipartita*, but is more cylindrical, and of a different and much brighter colour."

G. erecta. Grows in sandy rock-pools. Very rare. Perennial. Bearing fruit in winter. Torquay. Sidmouth. Gwyllyn Vase Bay, Falmouth, near low water-mark, Mr. W. P. Cocks. Belfast Bay. Port Ballantrae, North of Ireland. Roundstone Bay, Galway. Orkney. Fronds numerous, erect, one or two inches high, simple or once or twice forked without ramuli. Colour and substance about the same as in *G. confervoides.* Tubercles globose, placed near the tips of the branches; tetraspores in lanceolate receptacles.





W. DICKIE, Lith.

Fig 1. HYPNEA PURPURASCENS.

" 2. PTILOTA SERICEA.

Fig 3 POLYSIPHONIA FASTICIATA.

" 4. CRIFFITHSIA CORALLINA.

HYPNEA.

Name an alteration of *Hypnum*, the name of a genus of mosses, in allusion to the mossy character of some of the original species.

Frond filiform, cartilaginous, continuous, much branched, cellular; axis composed of minute cells, surrounded by large ones, which gradually diminish in size towards the outer surface.

Fructification: 1. Spherical *tubercles* (coccidia) either sessile or immersed in the ramuli. Tetraspores imbedded in the surface cells.

HYPNEA PURPURASCENS.—PURPLE HYPNEA.

Root composed of fibres. Stem naked at base for a short space, then set with alternate spreading, cylindrical, and filiform branches, which are often again branched, giving the plant a bushy appearance. Grows from six inches to two feet high. Substance firm, scarcely adhering to paper. Colour

purplish, nearly black when dry. Var. *β cirrhosa*, "irregularly branched and variously distorted; here and there swollen; the tips lengthened into tendrils, which coil round the stems of neighbouring plants." This variety shows an approach in habit to the foreign species of the genus, most of which produce similar tendrils. The tubercles form roundish swellings in the ramuli, commonly produced and discernible by the naked eye. Tetraspores dispersed through the branchlets. Grows on rocks, stones, and algæ, within tide-marks. Very common on all the British shores. Annual. Summer.

CRYPTONEMIACEÆ.—CRYPTONEMIA TRIBE.

Sea-weeds of a purple or rose-red colour, with filiform, rarely flat fronds; in texture gelatinous or cartilaginous; composed wholly or in part of cylindrical cells connected together into fibres. The centre of the frond is composed of fibres placed lengthways, the outer surface of radiating fibres.

Fructification: 1. *Conceptacles* (*favellidia*) globose masses of spores immersed in the frond, or in swellings of the branches. 2. *Tetraspores* variously dispersed.

This, the largest tribe of the red series, includes twenty-one British genera. In outward appearance and habit the species differ greatly from one another; but the structure in all is similar, consisting of articulated threads more or less firmly combined together. In Dudresnaia, when viewed through the microscope, the frond will be seen to consist of little bundles of filaments radiating from the centre; but in the plants of denser substance this structure cannot be seen, unless a portion of the frond be soaked for some time in fresh, or plunged for an instant into boiling water. Dr. Harvey says: "A piece of Gigartina acicularis thus treated will be changed into a body having the appearance, under the microscope, of a Dudresnaia or Nemaleon." Wart-like prominences, called *Nemathecia*, are common to many of the genera: these are described as consisting at first wholly of vertical filaments; but, after

a while, each thread is changed into a string of bead-like tetraspores, which structure, we are told, forms in Grymnogongius Griffithsia a most beautiful object for the microscope. All the species of Gigartina, with the exception of G. mamillosa, are very rare on our shores, being confined to those of Devon and Cornwall. G. Teedii has never been seen with tubercles at Torquay, its only British station. In the south of Europe, it is stated to be a common plant, producing fruit abundantly, and with much broader fronds than seen in our specimens. Gigartina mamillosa and Chondrus crispus are gathered by the poor, chiefly in Ireland, and sold under the name of *Carrigeen* or *Irish Moss* in the chemists' shops. In years of great scarcity, the peasantry on the western coast of Ireland are known to have subsisted entirely on these species, which are particularly abundant on that coast.*

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* See "Two Months at Kilkee."

GENERA OF THE CRYPTONEMIA TRIBE.

Grateloupia. Frond pinnated, flat, narrow, between membranaceous and cartilaginous. Structure very dense. Favellidia in the branches. Tetraspores scattered.

Gelidium. Frond pinnated, compressed, narrow, horny. Favellidia in swollen ramuli.

Gigartina. Frond cartilaginous, cylindrical, or compressed. Favellidia in external tubercles. Tetraspores sunk in the frond.

Chondrus. Frond fan-shaped, dichotomously cleft, cartilaginous. Tetraspores in *sori* immersed in the frond.

Phyllophora. Frond stalked, rigid, membranaceous, proliferous from the disk. Tetraspores in *sori* or in proper leaflets.

Peyssonelia. Frond depressed, expanded, rooting by the under surface.

Gymnogongrus. Frond filiform, dichotomous, horny. Tetraspores strung together, contained in wart-like *sori.*

Polyides. Root scutate. Frond cylindrical, cartilaginous, forked. Favellæ in spongy external warts. Tetraspores scattered through the outer stratum of the frond.

Furcellaria. Root branching. Frond cylindrical, dichotomous, cartilaginous. Favellæ unknown. Tetraspores contained in the swollen pod-like upper branches of the frond.

Dumontia. Frond cylindrical, tubular, membranaceous, of a dull red colour.

Halymenia. Frond either compressed or flat, of a gelatinous membranaceous structure, and pinky-red colour.

Ginannia. Frond cylindrical, dichotomous, traversed by a fibrous axis.

Kallymenia. Frond expanded, leaf-like, fleshy-membranous, solid, of dense structure.

Iridæa. Frond expanded, leaf-like, thick, leathery and fleshy.

Catenella. Frond filiform, branched, constricted into oblong articulations.

Cruoria. Frond crustaceous, skin-like.

Naccaria. Frond filiform, solid, cellular, the ramuli only composed of radiating free filaments.

Gloiosiphonia. Frond tubular, hollow; the walls of the tube composed of radiating filaments.

Nemaleon. Frond filiform, solid, elastic, filamentous; composed (externally) of free filaments, and, internally, of closely packed filaments.

Dudresnaia. Frond filiform, solid, gelatinous, filamentous; composed (internally) of interlacing filaments, forming a lax net-work; outer filaments free.

Crouania. Frond filiform, consisting of a jointed filament, whorled at the joints with minute gelatinous ramelli.

GRATELOUPIA.

Named in honour of Dr. Grateloup, a French algologist.

Frond flat, pinnate, membranaceous, solid, and

very dense in structure. *Fructification*: 1. Masses of spores (*favellidia*) immersed beneath the outer stratum. 2. Tetraspores in sub-defined sori.

GRATELOUPIA FILICINA.—SLENDER GRATELOUPIA.

Root a minute disk; fronds tufted, linear; stem tapering to the base, and tip more or less set with once or twice pinnated branches, drawn out at the tips and contracted at the base, as are likewise the ramuli. British specimens of this plant rarely exceed two inches in height: foreign ones are stated to be frequently eight to ten inches high. The substance is membranaceous, scarcely adhering to paper, but softer than in Gelideum corneum, some varieties of which it is not always easy to distinguish it from. "Colour a dull dark purple, some times greenish, very like that of Dumontia filiformis. *Favellidia* minute, immersed in the branches, with a pore; cruciate *tetraspores* in the smaller pinnules."—*Harv.* Grows attached to

rocks and stones at half-tide level, frequently where a small streamlet runs into the sea. Very rare. Perennial. October to December. Sidmouth. Exmouth "very fine," Mrs. Gulson. Torbay. Gwyllyn-vase Bay, Falmouth "rare," Mr. W. P. Cocks. St. Michael's Mount plentiful, and Long Rock in Mount's Bay more sparingly. Whitsand Bay, near the Land's End. Aberystwith. Ilfracombe. Lynmouth, Rev. W. S. Hore. Minehead, Somerset local, but not scarce, I. G.

GELIDIUM.

"Name, from *gelu*, frost; whence also *gelatine*." None of the species of the genus as it is now constituted are gelatinous.

Frond between cartilaginous and horny; compressed, linear, more or less regularly pinnated. *Fructification*: 1. *Tubercles* (*favellidia*) containing a mass of spores immersed in swollen ramuli. 2. *Tetraspores* in the ramuli.

GELIDIUM CORNEUM.—HORNY GELIDIUM.

Frond pinnate; branches linear, attenuated at each end. Pinnules mostly opposite, spreading, bearing within their tips elliptic tubercles. Colour a dark red. Substance cartilaginous, firm, and does not adhere to paper. Perennial. Summer. Of common occurrence on rocky shores. This is an extremely variable plant. Twelve varieties are described by Dr. Greville in his "Algæ Britannicæ;" viz. :—

b. sesquipedale. Frond four to eight inches high, between compressed and flat, linear, tripinnate, pinnæ, attenuated at their base; ramuli linear-oblong, short obtuse. Sidmouth.

c. pinnatum. Frond two to six inches high, narrow, tripinnate; the pinnæ patent, nearly linear, bluntish. Coasts of Devon and Cornwall, &c. Bute.

d. uniforme. All the pinnæ patent, attenuated at the base, obtuse at the points, and scattered. Ilfracombe.

e. capillaceum. Frond five or six inches high, narrow; pinnæ clustered towards its summits, nearly setaceous, and somewhat erect. Sidmouth. King's Cove, Cornwall.

f. latifolium. Frond two or three inches long, one or two lines broad, nearly flat; pinnæ linear-lanceolate, mostly simple, set with numerous short setaceous pinnulæ. Torbay. Trevone Bay, Cornwall. Falmouth, Miss Warren. St. Mawes, Cornwall, I. G. Sidmouth. Malbay, west of Ireland. This is a very pretty variety, often of a light-red hue.

g. confertum. Frond two or three inches high, compressed, repeatedly pinnated, pinnæ and pinnulæ long, very thin, acute, and irregularly divided. Devonshire. Bute. Falmouth, Miss Warren.

h. aculeatum. Frond one or two inches high, compressed very thin, pinnated very irregularly, pinnæ divaricated, irregularly divided, and set with minute, divaricate, awl-shaped ramuli crowded towards the summit of the frond. Mount's Bay, Mrs. Griffiths.

i. abnorme. Frond two inches high, compressed,

irregularly branched, branches and pinnæ producing t their extremities little tufts of partly deflexed ramuli. North of Cornwall, Mrs. Griffiths.

j. pulchellum. Frond capillary, compressed, tripinnate, pinnæ between linear and clavate obtuse. Bantry Bay.

k. claviferum. Frond sub-cylindrical, capillary, irregularly divided, the ultimate ramuli or pinnulæ obovate-edged with minute scattered teeth. Bantry Bay. Gwyllyn-vase Bay, Falmouth, I. G.

l. clavatum. Frond capillary, between cartilaginous and membranaceous, decumbent, creeping, ramuli in the form of inversely-lanceolate or ovate leaves, much attenuated at their insertion. South of England, frequent. Very common on rocks at Clevedon growing along with *Catenella Opuntia*, and at Minehead, Somerset, on woodwork, I. G. Frith of Forth.

m. crinale. Frond setaceous, sub-cylindrical, somewhat dichotomously branched, sometimes three-forked at the top, and bearing a few ellipti-

cal-oblong ramuli attenuated at their insertion. East and South of England. Belfast Lough.

GELIDIUM CARTILAGINEUM.—CARTILAGINOUS GELIDIUM.

Frond twelve to eighteen inches long, rising from a mass of fibres; the stems naked at base, in the upper part twice or thrice pinnate, the pinnæ and pinnulæ alternate, gradually diminishing in size. Tubercles terminating the smaller pinnulæ, pointed. Colour a fine, dark purple, becoming scarlet, orange, yellow, and finally greenish on exposure. Substance cartilaginous, horny when dry. Grows on rocks in the sea. Probably not a native of our seas. Once found many years since by Dr. Withering at Freshwater Bay, Isle of Wight. In 1849 several specimens picked up after a gale on the shore near Ryde, were given to my friend Mr. E. H. Sheppard; one of these he presented me with, and it is from this specimen that Dr. Harvey has taken his beautiful and accurate figure in the "Phycologia

Britannica," Pl. 337. It is a large and elegant plant not likely to be overlooked even by the most inexperienced collector. Sphærococcus coronopifolius resembles it a good deal in miniature, and the tubercles are very similar in shape, but the pinnæ in G. cartilagineum are regularly alternate, which gives the plant a beautiful fern-like appearance. Dr. Harvey informs me in a letter, "That this plant is common at the Cape of Good Hope and on the *Pacific* coast of North America, but we have no *certain* knowledge of any station nearer to England than the Cape. *Old* writers mention several places in the Mediterranean and even in the North sea, but these stations are omitted by moderns; I fear it has no *just* claim on the British Flora."

GIGARTINA.

Name meaning a *grape-shot*, which the tubercles resemble.

Frond cartilaginous (filiform, compressed or flat), irregularly divided, purple or dark red. *Fructifica-*

tion: 1, external *tubercles*, containing dense clusters of *spores* (favellidia); 2, tetraspores scattered through the surface of the frond.

GIGARTINA MAMILLOSA—WARTY GIGARTINA.

Fronds from three to six inches high, forked, the segments wedge-shaped, stem channelled. Tubercles borne on small processes, in great numbers, on the surface of the upper segments, giving them the appearance of being covered with small warts. Colour a dark purple. Substance tough and cartilaginous. Grows on rocks, stones, in pools near low water-mark. Common. Perennial. Autumn and Winter.

O. S. *G. pistillata.* Grow on rocks, near low water-mark. Very rare. Perennial. Spring. Coast of Cornwall, in several places. Whitsand Bay, near Plymouth. Mount Bay. Padstow. Jersey. Fronds from three to six inches long, narrow, compressed, forked; when in fruit the upper

branches are set with short ramuli, which bear the tubercles either at their tips or on the sides. Colour a dull purple, not unlike that of *Polydes rotundus* when dry. Substance cartilaginous. When without fruit, this species nearly resembles some of the narrow forms of *C. crispus*.

G. acicularis. Grows on rocks near low water-mark. Rare. Annual? Winter. Several places on the coasts of Devon and Cornwall. Sidmouth. Torquay in December, with tubercles very fine; Mrs. Griffiths. Ilfracombe. Belfast Bay. Kilkee, West of Ireland, very rare. Valentia, abundant. Jersey. Frond cylindrical, filiform, irregularly branched. Stem arched, branches curved, ramuli few. Colour a dull purple, becoming darker in drying. Two to four inches in height.

G. Teedii. Grows on rocks at the extreme limit of low water-mark. Very rare. Perennial. Elbury Cove and Tor-Abbey Rocks; Mrs. Griffiths. "Frond membranaceous, flaccid (horny when dry), flat, linear, acuminate, repeatedly

pinnated with slender, horizontal, distichous, subulate ramuli;" Harv. This plant is not unlike the var. *latifolium* of G. Corneum, but the substance when fresh is said to be much softer, and the colour is a dull-brown red, becoming brighter in fresh water.

CHONDRUS.

Name signifying *cartilage*, in allusion to the substance of the frond.

Frond cartilaginous, nerveless, compressed, or flat, fan-shaped, dichotomously cleft. *Fructification:* 1, prominent *tubercles* (*nemathecia*), containing spores; 2, *tetraspores* in sori, immersed in the frond; 3, *favellidia* immersed in the frond, and scattered over its segments, containing minute spores.

CHONDRUS CRISPUS.—CRISP CHONDRUS.

Fronds forked, curled, or flat; the segments

varying greatly in breadth; when growing in the shallow water, the frond is mostly broadly fan-shaped with broad segments an inch and a half or more wide, while in deep water plants the stem is five inches in length, and the divisions of the frond exceedingly narrow, and repeatedly forked. Mrs. Griffiths, in describing it in Turner's History of Sea-weeds, says, "Every pool upon the Devonshire coast produces a dissimilar sort, and where there is any mixture of fresh water, the varieties are monstrous as well as endless." Chondrus crispus is frequently iridescent, reflecting beautiful pearly hues, especially when growing in shaded pools; its true colour is a dark purple, but it is often yellowish or greenish according to the shallowness of the pool in which it grows—substance tough, horny when dry. Very common. Perennial. Spring. This, and *G. mamillosa* are sold in the shops under the name of *Carrigeen* or *Irish Moss*, which, when well boiled, forms a pleasant and nutritious jelly.

CHONDRUS NORVEGICUS.—RED CHONDRUS.

From two to three inches high, flat and forked, the tips of the segments rounded. Nemathecia, wart-like fruit, common, large, and very conspicuous on the segments. Colour a deep red—substance stiff and thickish. The specific of this plant appears to be very inapplicable to it, for there is a doubt whether it be known at all on the coasts of Norway, and it is chiefly confined on our shores to the south of England and Ireland, where it is not common. Grows on the rocks near low water-mark. September to March. Dover. Coast of Sussex. Exmouth. Plymouth. Falmouth Bay, "local, and but seldom met with." Miss Warren. Mount's Bay. Swansea. Minehead, Somerset, cast ashore occasionally, I. G. Saltcoats, Ayrshire; Dr. Landsborough, Antrim. Wicklow. Youghal. Bantry. Miltown Malbay.

PHYLLOPHORA.

Name *leaf-bearing*, so called from the proliferous fronds of the species.

Frond stalked, rigid-membranaceous, proliferous, nerveless or with a vanishing nerve, cellular, cells minute. *Fructification*: 1, *tubercles* scattered over the frond, containing spores; 2, *warts* (*nemathecia*) seated on the frond, at length containing spores; 3, *tetraspores*, collected into sori, either towards the tip of the frond or in proper leaflets.

PHYLLOPHORA RUBENS.—RED PHYLLOPHORA.

Fronds tufted, three to eight inches high. Stem small, expanding into a simple or more often forked frond; from the surface of the segments, another similar-shaped frond arises, which again bears a new frond in like manner. *Tubercles* sessile, small, scattered over the frond, warts (*nemathecia*), common, concealed under little leafy processes,

borne on the surface of the frond, substance stiff and rigid, not adhering to paper. Colour a fine red. This plant is always more or less covered with the smaller zoophytes. Grows on rocks near low water-mark. Perennial. Not uncommon on the English and Irish shores, but more rare in Scotland and chiefly on the western coast.

PHYLLOPHORA MEMBRANIFOLIUS.—LILAC PHYLLOPHORA.

Fronds three to twelve inches high. Stem cylindrical, irregularly divided, bearing wedge-shaped or fan-shaped cleft frondlets. The stem is stiff and cartilaginous, the frondlets are membranaceous and adhere to paper. Colour a lilac-purple. *Tubercles* on short stalks seated on the stem. *Nemathecia* frequent on the frondlets, in the form of long deep red spots. Grows frequently on rocky shores between tide marks. Perennial. October to March.

PHYLLOPHORA BRODIÆI.—BRODIE'S PHYLLOPHORA.

In this species the root is a small disk, the stems cylindrical, expanding into simple or forked flat membranceous frondlets, often producing a young frond at the extremity, which springs from a short stalk. In appearance, the present species is not very unlike *P. rubens*, but smaller and much more delicate in substance, and readily known by its being proliferous from the *tips* of the frond, instead of from the surface, as in *P. rubens*. "*Nemathecia* large, globose, dark red, sessile on the tips of frond, at length converted into strings of *tetraspores*." Grows on rocks. Rare. Perennial. Spring. Eastern coast of Scotland, frequent. Mouth of the Bann, County Derry. Belfast Bay. Plymouth, Rev. W. S. Hore.

PHYLLOPHORA PALMETTOIDES.—SMALL PHYLLOPHORA.

Root a widely-expanded disk, from which a large number of stems issue. Stem short, simple or branched, expanding into a mostly undivided or once forked frond, one or two inches long, which sometimes bears small leaflets from its tip or surface. "Towards the apex of the leaf, in fertile specimens, is a large transverse elliptical sorus, immersed in the substance, composed of a multitude of minute tetraspores. No other fructification has been observed." *Harv.* Known from *P. Brodiæi* by its bright rose-colour, large root and different position of the sori. Grows on rocks near low water-mark. Perennial. Winter and Spring. Rare. Shores of Devon and Cornwall.

PEYSSONELIA.

Named in honour of J. A. Peyssonel, an early and meritorious observer of marine plants.

Frond brownish-red, depressed, rooting by the

under surface, concentrically joined. *Fructification:* warts scattered over the upper surface of the frond containing tetraspores.

PEYSSONELIA DUBYI.—DUBY'S PEYSSONELIA.

"Frond one or two inches across; at first, orbicular; afterwards, irregularly lobed; membranaceous, thin, adhering closely by its under surface, which is clothed with short radicles to the surface on which it grows. Colour dull-brown red. On old shells, stones, &c.; on scallop banks in ten to fifteen fathoms water. Shores of the British Islands not uncommon."—Harv.

GYMNOGONGRUS.

Name signifying *naked wart-like swellings*, in allusion to the appearance of the fruit in this genus.

Frond cylindrical or compressed, horny, much branched. Structure very dense. *Fructification:*

naked warts containing strings of bead-like tetraspores.

GYMNOGONGRUS GRIFFITHSIÆ.—GRIFFITHS' GYMNOGONGRUS.

Fronds from two to four inches high; tufted and repeatedly forked. Substance and colour not unlike Gracilaria confervoides. Fructification: small warts surrounding the stem containing tetraspores. These are described by Dr. Harvey, in the "Phycologia Britannica," as most beautiful: when seen under the microscope, each appears marked, with a white cross enclosed in a covering, and brilliant as a ruby. Perennial. Autumn and winter. Grows on rocks, mostly within tide-marks. Coast of Devon. Torbay. Long Rock in Mount's Bay, Cornwall. Balbriggan. Bantry Bay. Malahide. Odius' Bay, Stronsa.

GYMNOGONGRUS PLICATUS.—MATTED GYMNOGONGRUS.

Fronds from four to ten inches high, wiry, very rigid and much entangled, branched, irregularly forked, cylindrical throughout, the ramuli often secund. Colour a very dark purple, whitish in decay. Substance stiff and horny. Fructification is supposed to exist in the warts which arise on the stems of this plant; but Dr. Harvey states he has never succeeded in finding either spores or tetraspores in them. Common on rocky sea-shores. Perennial.

POLYIDES.

Name signifying *many forms*, but not well applied to this genus.

Root an expanded disk. *Frond* cylindrical, forked, cartilaginous, solid. *Fructification:* 1. Naked irregular-shaped, spongy warts, composed of forked filaments, through which are scattered clus-

ters of spores. 2. Cruciate *tetraspores* immersed in the outer surface of the frond.

POLYIDES ROTUNDUS.—ROUND POLYIDES.

Fronds from four to six inches high, repeatedly forked, with a rounded outline, many stems springing from the same root. All the axils of the branches *rounded.* In winter pale warts encircle the upper branches, these of white articulate filaments, among which are imbedded clusters of spores (*favellæ*). The secondary fruit Mrs. Griffiths has found in specimens from Sidmouth: these have the upper ramuli slightly swollen, and contain imbedded tetraspores. This plant, when without fruit, is known from the following by the *rounded* axils of its branches and different root. Colour a dark reddish-brown. Substance rigid when dry. Grows on stones in sandy pools near low-water mark. Perennial. Autumn and winter. Southern

and eastern shores of England and Ireland. Rather rare in Scotland.

FURCELLARIA.

Name meaning a *little fork*, in allusion to the forked frond.

Root branching. *Frond* cylindrical, forked, cartilaginous, solid. *Fructification: tetraspores* imbedded in the swollen tips of the fronds.

FURCELLARIA FASTIGIATA.—TUFTED FURCELLARIA.

Fronds six to twelve inches high, undivided at the base, but afterwards repeatedly forked; all the axils of the branches *acute*. Root composed of creeping fibres. Substance between fleshy and cartilaginous. Colour brownish purple, darker when dry, The tips of the branches, when in fruit, become much swollen, elongated, and pod-like, and contain pear-shaped tetraspores divided

into four joints or sporules. These *receptacles* or swollen tips fall off when ripe; the plant then appears with blunted branches. The *spores* have not been observed in this species. Grows on rocks and stones between tide-marks. Frequent. Perennial. Bearing fruit in winter.

DUMONTIA.

Named in honour of M. Dumont, a French Naturalist.

Frond tubular, composed internally of a network of interlacing filaments, externally of a membrane consisting of a single layer of small cells. *Fructification:* 1. Clusters of spores (*favellæ*) formed on the internal fibres. 2. Cruciate *tetraspores* dispersed beneath the outer membrane of the frond.

DUMONTIA FILIFORMIS.—STRING-LIKE DUMONTIA.

Frond varying from twelve to three inches in height; bears alternate branches, usually simple,

and tapered at the base and tips; tender and gelatinous in substance. Colour a dull purple, sometimes greenish or yellowish when growing in shallow pools. The *favellæ* are at times abundantly scattered over the frond; and Dr. Harvey has recently contradicted the statement which he formerly made in the "Phycologia," and in his last edition of the "Manual of British Algæ," to the effect that the *tetraspores* of this plant were rare—subsequent observation having assured him that they are of very common occurrence. In the variety β *crispata*, the fronds are flattened, curiously curled and twisted, arising from the base; in other forms the branches proceed from a main stem, and are not above two or three inches high. Grows on rocks and stones in pools between tide-marks; β *crispata* in places exposed to tidal streams or currents. Common. Annual. Summer.

HALYMENIA.

Name meaning *sea-membrane.*

"*Frond* compressed or flat, gelatinoso-membranaceous, consisting of a double membrane, separated by a very lax network of articulated filaments; cells of the membrane minute, coloured." *Fructification:* masses of *spores* (*favellidia*) immersed in the frond.

HALYMENIA LIGULATA.—STRAP-LEAVED HALYMENIA.

A soft, membranaceous, pinky-red coloured plant, very variable in the shape and branchings of its fronds as well as in substance, but resolvable, according to Dr. Harvey, into the three following varieties :—"1. *dichotoma.* Frond six to eight inches long, half a line to one or two lines broad, compressed, very gelatinous, many times in an irregularly dichotomous manner; the divisions nearly of equal breadth, becoming gradually narrower

towards the extremities, which are tapering and pointed. 2. *ramentacea.* Frond twelve to fourteen inches long, compressed, divided into three or four principal lobes or branches, from half an inch to an inch in breadth, and from one to four inches long, attenuated at base, thence cylindrical till near the tip, when they again slightly taper. In substance this closely resembles the first variety, containing a great quantity of gelatine, the external membrane being very thin and of a pale rose-colour. 3. *latifolia.* Frond twelve to twenty inches long, twenty-four inches wide in the widest part, rising from a minute stem, wedge-form, either simple or forked, or once or twice regularly cleft in a palmate manner; the segments one or two inches broad, destitute of ramuli; of a dark-red colour and soft, but not very gelatinous substance (very similar in feel to *Kallymenia reniformis*); perfectly flat, the stratum of gelatine interposed between the membranes being very thin. The fructification is abundantly scattered over every part of the frond, and to the naked eye resembles minute dark-red

dots." Grows on rocks and stones in the sea. Chiefly found along the southern shores of England and Ireland. Annual. Summer.

GINANNIA.

Named in honour of Count G. Ginanni, author of an early work on the productions of the Adriatic.

Frond round, forked, membranaceo-gelatinous, with a fibrous axis; cells of the surface-membrane, hexagonal. *Fructification:* masses of spores immersed in the frond.

GINANNIA FURCELLATA.—FORKED GINANNIA.

From two to six inches high, tender, cylindrical, very regularly forked, either firmly or loosely gelatinous in substance, and of a pinky-red colour. Irish specimens, Dr. Harvey says, are much larger than English ones. Some are remarkable for possessing a distinct midrib, and the branches of the

broader specimens are frequently constricted as if tied, when the frond assumes a jointed appearance. The fructification appears scattered over the frond like minute grains of sand. Grows on rocks and stones in the sea. Rare. Eastern and southern shores of England. Sherringham, Norfolk. Southampton. Budleigh Salterton. Exmouth. Torquay. Mount's Bay, Cornwall. All round the Irish coast, but nowhere common. Howth. Strangford Lough. Belfast Bay. Glenarm. Bantry Bay. Miltown Malbay. Roundstone Bay.

KALLYMENIA.

Name meaning *beautiful membrane.*

Frond blood-red, ribless, expanded, of a thickish membranaceous substance; structure consisting of three distinct *strata*, the inner of filaments, the middle of large round cells, and the outer of minute ones. *Fructification:* 1. masses of spores (*favellidia*), partly immersed in the frond; 2. scattered tetraspores.

KALLYMENIA RENIFORMIS.—KIDNEY-SHAPED KALLYMENIA.

"*Stem* minute, cylindrical, suddenly expanding into a roundish or reniform, undivided (or accidentally cleft) frond, of a soft, thickish, membranaceous substance, becoming thinner in drying, of a fine blood-red colour, and either simple, or bearing along its margin lobes of a shape similar to the frond. The fronds vary in diameter from one inch to six, eight, and even fourteen inches. *Favellidia* of small size, thickly scattered over the frond; *tetraspores* very minute, imbedded in the frond, over which they are dispersed."—Harv. Man., 2nd ed., p. 150. Grows on rocks, &c., in deep pools, near low water-mark. Rather rare. Perennial. Summer and autumn. Niton, Isle of Wight. Torbay and Ilfracombe, very fine, Mrs. Griffiths. Whitesand Bay, near the Land's End, Cornwall. Scilly Isles. Jersey. Glenarm. Antrim. Bangor, County Down. Mouth of the Bann. Bantry Bay. Coast of Kerry. Malbay and Kilkee, Orkney.

KALLYMENIA DUBYI.—DUBY'S KALLYMENIA.

Fronds from six to twelve inches long, with scarcely any stem, tapering to the base, either wedge-shaped or obovate, at first quite simple, afterwards often torn. In one specimen, which I received from my friend, Miss Warren, of Falmouth, a young frond arises from the margin of the old one in the same way as often occurs in *K. reniformis*. Colour a dull brown red, becoming pale and yellow in old age. Substance like that of *K. reniformis*. Favellidia very minute, densely scattered over the surface. Grows on rocks and stones within tide-marks in land-locked bays. Annual. Spring and early summer. Discovered by Miss Warren, in Falmouth Harbour, in 1844. Plymouth, Rev. W. S. Hore. Carnlough Bay. Belfast Bay.

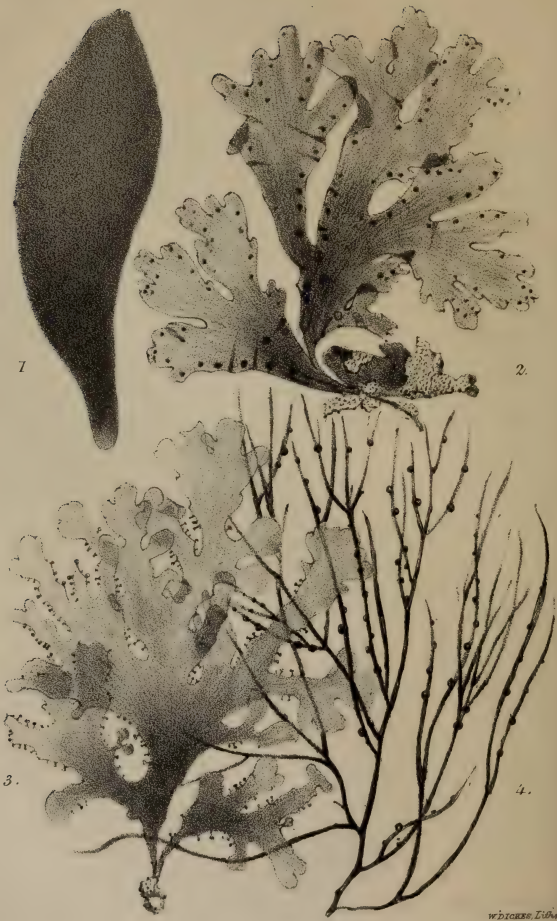


Fig 1. IRIDÆA EDULIS.

2. NITOPHYLLUM LACERATUM

Fig 3. GRACILARIA CONFERVOIDES.

4. RHODYMENIA LACINIATA.

IRIDÆA.

Named from the *iridescent* hues of some of the species when recent.

Frond flat, expanded, dull red, fleshy or cartilaginous; internal substance consisting of densely interwoven fibres, outer of closely-packed beaded filaments. *Fructification:* 1. masses of spores (*favellidia*) immersed in the frond; 2. *tetraspores* placed beneath the outer surface of the frond.

IRIDÆA EDULIS.—EDIBLE IRIDÆA.

Fronds from four to eighteen inches long, and two to eight inches wide, many springing from the same disk-like root; simple, rounded at the tip, narrowing at the base into a short stem, occasionally cleft by the action of the waves. Colour a fine deep red, becoming much darker, frequently blackish, when dried. Substance thick and rather leathery. *Favellidia* in wide patches, frequently spreading

over a large portion of the frond, containing minute spores. *Tetraspores* forming dense band-like sori, beneath the outer substance of the frond. Common on rocks and stones in the sea. Perennial. Autumn and winter. The fronds of this species are stated to be eaten by the poor, either raw or after being pinched with hot irons, when the taste is said to resemble roasted oysters.

CATENELLA.

Name meaning a *little chain.*

Frond dull purple, membranaceous, filiform, constricted at intervals; composed internally of a lax network of interlacing filaments. *Fructification*: 1. Masses of spores (*favellidia*) contained in external capsular bodies. 2. *Tetraspores* immersed.

CATENELLA OPUNTIA.—OPUNTIA-LIKE CATENELLA.

Fronds from half an inch to an inch high; con-

tracted as if jointed, rising from creeping fibres densely matted together. Colour a very dark purple, almost black when dry. Substance tender, but not adhering to paper. Not uncommon. Creeps over rock, in the crevices of large boulders, and on woodwork near high-water mark.

CRUORIA.

Name meaning *blood*, because the plant looks like a blood stain.

Frond between gelatine and leathery, forming a skin on the surface of rocks; the structure consists of simple-jointed filaments set in a firm gelatine; one of the joints of each filament is larger than the rest. *Fructification:* tetraspores lying at the base of the filaments.

CRUORIA PELLITA.—SKIN-LIKE CRUORIA.

"*Fronds* forming smooth glossy patches of from two to three or more inches in diameter, at first

circular, afterwards irregularly shaped; between gelatinous and leathery; wholly composed of vertical filaments set in a colourless jelly."—*Harv.* Common on smooth exposed rocks and stones between tide-marks. Perennial. Fruiting in February. West of Ireland very abundant.

NACCARIA.

Named in honour of F. L. Naccari, an Italian Algologist.

"*Frond* cylindrical or compressed, filiform, rose-red; central cells large, empty; those of the surface minute. *Ramuli* composed of jointed, dichotomous, whorled filaments, surrounded by free gelatine. *Fructification:* spores attached to the whorled filaments of the swollen ramuli."—*Harv.*

NACCARIA WIGGHII.—WIGG'S NACCARIA.

Frond from six to twelve inches high, filiform, cylindrical; main stem set with alternate branches,

spreading on each side, and thickly set with minute slender ramuli. The structure of the stem and branches is cellular, while the ramuli are composed of minute gelatinous filaments, to which the spores are attached: when these are present, the ramuli become much swollen. Substance tender and gelatinous, adhering very well to paper. Colour a fine rose-red, given out to fresh water. Very rare Usually cast ashore from deep water. Annual. Summer. Yarmouth. Folkestone. Brighton. Exmouth, Mrs. Gulson. Sidmouth. Torquay. Jersey, Miss Turner. Belfast Bay. Wicklow. Bantry Bay. Kilkee, co. Clare.

GLOIOSIPHONIA.

Name meaning *viscid tube*, in allusion to the gelatinous-tubed frond.

Frond cylindrical, filiform, tubular, somewhat gelatinous; outward surface consisting of very minute jointed filaments. *Fructification:* globules of spores (*favellidia*) imbedded and attached to the filaments of the surface.

GLOIOSIPHONIA CAPILLARIS.—SLENDER GLOIOSIPHONIA.

"*Fronds* three to twelve inches high, fine rose-red, of a lanceolate outline; much branched in a repeatedly pinnate manner, the main branches often a line in diameter; ramuli very slender; the branches and ramuli generally opposite; much attenuated at the base and apex."—*Harv.* Grows in tide-pools near low-water mark. Very rare. Annual. Summer. Scarborough. Sheerness. Sidmouth and Meadfoot, Devon. Falmouth, Miss Warren. Mount's Bay, Cornwall. Anglesea. Howth. Balbriggan. Glenarm. Bantry Bay. Roundstone Bay, Galway. Appin, Argyleshire. Saltcoats, on shale. Arran.

NEMALEON.

Name meaning a *crop of threads.*

Frond cylindrical, gelatinoso-cartilaginous, elas-

tic, solid; the axis dense, composed of closely-packed longitudinal filaments; the periphery of dichotomous filaments, whose ultimate ramuli are moniliform and coloured. *Fructification:* masses of spores (*favellidia*) attached to the outer filaments.

NEMALEON MULTIFIDUM.—FORKED NEMALEON.

Fronds three to six inches high, slightly branched, forked, and very elastic. Colour a dull purple. Grows on shells and stones near low water-mark. Not unfrequent. All round the coast.

NEMALEON PURPUREUM.—PURPLE NEMALEON.

Frond from eight inches to two feet or more in length, two or three lines broad in the middle of the stem; set with many elongated simple branches,

from which often arise another series of similar branches; all the extremities of the frond drawn out and pointed. This species, in outward aspect, somewhat resembles Dumontia filiformis; but seen under a lens of low power, the branches appear, it is said, like tubes of glass, densely covered with brilliant purple studs. Substance tender, soft, and slippery, but not very elastic. Colour varying from a fine deep purple-red to a dull pink, rapidly given out in fresh water, and becoming browner in drying. Grows on stones, and in sandy places among *Zostera*, near low-water mark. Annual. Summer. Rare. Sidmouth. Exmouth, Mrs. Gulson; remarkably broad in the frond. One specimen this lady informs me she found, in the autumn of 1849, "in height not more than seven and a half inches; but the breadth of the fronds is most remarkable, in some parts measuring more than an inch across, and in many places three-quarters and an inch! It is so different from the usual examples found at Torbay or Sidmouth, that only a microscopic examination would convince the

observer of its identity with the common plants of *N. purpureum.*" Whitsand Bay, near Plymouth; once found growing in this locality by the Rev. W. S. Hore, in tolerable plenty. "I have visited the spot," he writes, "nay, the very rock, several times since, at the exact time, but not a vestige of it could I perceive." Kilkee. Miltown, Malbay. Ballriggan.

DUDRESNAIA.

Name in honour of M. Dudresnay, a French Naturalist.

Frond cylindrical, gelatinous, elastic; the axis formed of a lax network of filaments, coated with longitudinal fibres; the periphery composed of forked moniliform filaments. *Fructification*: 1. globular masses of spores attached to the filaments of the periphery; 2. external *tetraspores*, borne by the filaments of the periphery.

DUDRESNAIA COCCINEA.—ROSE-RED DUDRESNAIA.

Frond four to eight inches high, irregularly branched, tender and soft, of a beautiful red-pink colour; under a lower power lens the fronds look not unlike pieces of *chenille*. The fruit consists of masses of minute spores and of *tetraspores* borne abundantly on the ramuli. Southern shores of England and Ireland. Very rare. Summer. Brighton. Sidmouth. Torquay. Plymouth. Falmouth Harbour, Miss Warren, "occasionally plentiful." Jersey. Exmouth, Mrs. Gulson.

DUDRESNAIA HUDSONI.—HUDSON'S DUDRESNAIA.

"Frond much branched, filiform, pale reddish; branches mostly opposite, horizontal; once or twice pinnate; ramuli numerous, irregular, obtuse. Substance tender and gelatinous."—*Harv.* On stones

and shells between tide-marks, not uncommon. Summer.

CROUANIA.

Name in honour of the brothers Crouan, of Brest, celebrated among French Algologists.

Frond gelatinous, filiform consisting of a jointed, simple-tubed filament, whose joints are clothed with dense whorls of minute, multifid ramelli. Fructification: 1. *favellidia* containing a mass of minute spores, situated near the tip of the ramuli; 2. *tetraspores* affixed to the bases of ramuli.

CROUANIA ATTENUATA.—SLENDER CROUANIA.

From one to two inches high, of a purplish red colour, very slender and gelatinous; much branched. the branches resembling strings of minute beads. "The joints of the main thread are sometimes short, sometimes of considerable length: in the

former case the globular whorls (or *beads*) conceal the main thread altogether; in the latter they are widely separated, and then the plant, under a low power of the microscope, something resembles *Ceramium diaphanum*." Fructification, tetraspores of large size, resembling those of *Callithamnion*: the favellidia were not known on English plants until Miss Warren discovered them in 1850. Parasitical on *Cladostephus spongiosus*. Very rare. Salcombe, Devon. Mrs. Wyatt. Plymouth, on *Corallina officinalis*, Mr. Boswarva. Falmouth with favellidia, Miss Warren, 1850. Mousehole, near Penzance, Mr. Ralfs.

CERAMIACEÆ.—CERAMIUM TRIBE.

"Rose-red or purple sea-weeds, with a filiform frond, consisting of an articulated, branching filament, composed of a single string of cells, sometimes coated with a stratum of small cells. *Fructification*: 1. *favellæ*, berry-like receptacles, containing numerous angular spores; 2. *tetraspores*

attached to the ramuli or more or less immersed in the substance of the branches, scattered." *Harv.*

The greater proportion of the plants in this tribe are remarkable for the delicate beauty of their filaments. In Ceramium the fronds are all more or less clearly articulate, in some species the whole of the articulation is coated with coloured cells, in others it is transparent, and the partitions alone are opaque, giving a very pretty chequered appearance to the frond. C. diaphanum belongs to this latter section, and C. rubrum to the former; the third section, *Ciliata*, includes species with both coloured and uncoloured articulations, but whose fronds are armed either with microscopic hairs or spines; C. ciliatum is an example of this section, all the species of which form interesting objects for the microscope, nor can their specific characters be determined without its aid. Griffithsia setacea is one of the commonest species of Griffithsia; it is remarkable for the bursting and crackling of the membrane when first placed in fresh water; all the species are

liable to stain the paper on which they are dried, of a pink colour, but G. setacea parts with its colouring matter directly on coming in contact with fresh water. Two new species have been discovered by the Rev. W. S. Hore, at Plymouth, and the beautiful and rare *G. barbata* has been found growing on algæ, at Jersey, by Miss Turner. Wrangelia chiefly differs from Griffithsia in having *scattered* tetraspores. In Seirospora the tetraspores are in bead-like strings, a character which separates the genus from Callithamnion; this latter is an extensive genus containing thirty-one species; many of them are most beautiful and exquisite little plants of a rosy or pink colour, with finely divided feather-like branchlets. The following poetic description, by Bishop Mant, though applied by him to a different class of plants, equally well portrays this delicate and no less lovely growth of the ocean :—

> "Soft as the cygnet's downy plume,
> Or produce of the silk-worm's loom;
> Survey them by the unaided eye,
> And if the seeds within you lie

Of love for *natural beauty* true,
They'll shoot enlivened at the view
Of hair or feather-mantled stem,
The waving stalk, the fringed gem,
Enveloping its chaliced fruit,
So fair, so perfect, so minute,
That bursting forth, the seeds may seem
A floating cloud of vapoury steam.
These by the microscopic glass
Surveyed, you'll see how far surpass
The works of nature, in design
And texture delicately fine,
And perfectness of every part,
Each effort of mimetic art."

The largest and most luxuriant specimens of the Callithamnii are found in the neighbourhood of Plymouth, growing often in muddy situations, which appear particularly favourable to the growth of some delicate species, such as C. Borreri, C. roseum, and C. gracillimum. In the following pages, the reader will find a complete summary of all the British Callithamnii and their habitats, accompanied by the characters which chiefly distinguish each species from the one most nearly resembling it. Trentepohlia pulchella, a freshwater alga inhabiting mountain streams, belongs to this

tribe: with the exception of Bostrychia scorpioides, it is the only member of the Rhodosperms which grows in fresh water and in its aspect it very nearly resembles Callithamnion Daviesii.

GENERA OF THE CERAMIUM TRIBE.

Ptilota. Frond compressed, inarticulate, distichous, pectinato-pinnate. Favellæ stalked, involucrate.

Microcladia. Frond filiform, inarticulate, dichotomous. Favellæ sessile.

Ceramium. Frond filiform, articulate, dichotomous. Tetraspores mostly immersed.

Spyridia. Frond filiform, inarticulate, the branches clothed with minute bristle-like, articulated ramuli. Tetraspores sessile on the ramuli.

Griffithsia. Frond articulated, dichotomous, or clothed with whorled, dichotomous ramuli, rose-red. Favellæ involucrated, sessile, or stalked. Tetraspores sessile, on whorled ramuli.

Wrangelia. Frond articulated, pinnate. Tetraspores scattered in the ramuli.

Seirospora. Frond articulated. Tetraspores in bead-like strings.

Callithamnion. Frond, at least the branches and ramuli articulated, mostly pinnated. Favellæ sessile. Tetraspores sessile or stalked, scattered.

PTILOTA.

Name meaning *pinnated*, in allusion to the finely pinnate frond.

Frond inarticulate, linear, compressed or flat, distichous, pectinato-pinnate; the pinnules sometimes articulate. *Fructification:* 1. roundish, clustered *favellæ* surrounded by an involucre of short ramuli; 2. *tetraspores* attached to or immersed in the ultimate pinnules."

PTILOTA PLUMOSA.—FEATHERY PTILOTA.

Fronds from three to fourteen inches high, much and irregularly branched, the branches set with slender opposite ramuli, fine, delicate, and feather-like. The colour a dark red. Substance cartilaginous. Grows on the stems of Laminaria digitata. Perennial. Summer and Autumn. Common on the shores of Scotland, and the northern and western coasts of Ireland. Rare on the English shores. Scarborough. Holyhead. Gwyllyn-vase Bay, Falmouth, "Several fine specimens in the Autumn of 1844, after rough weather;" Mr. W. P. Cocks.

PTILOTA SERICEA.—SILKY PTILOTA.

Fronds tufted from two to six inches; this is a slender and more flaccid plant than the preceding, with the extreme ramuli jointed. Colour a very dark or brownish red. Substance soft. Grows on

rocks between tide-marks, common; rarely on the stems of Fucus serratus. Frequently on the south-west of England where P. plumosa is not known. Perennial. Summer and Autumn.

MICROCLADIA.

Name meaning a *small branch.*

Frond filiform, compressed, distichously branched. *Fructification:* 1. roundish *favellæ* with an involucre; 2. *tetraspores* immersed in the ramuli.

MICROCLADIA GLANDULOSA.—PINK MICROCLADIA.

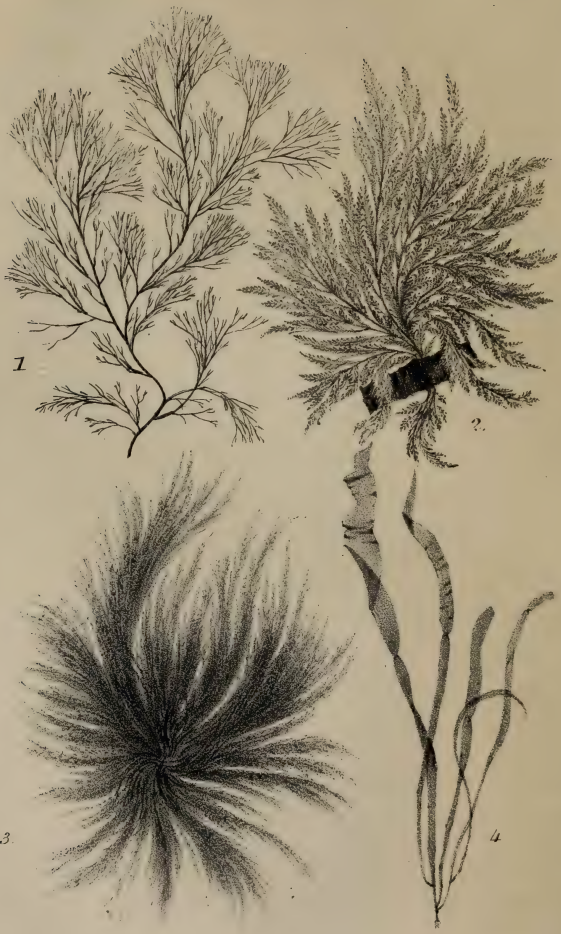
Fronds narrow, compressed, one or two inches high, much branched, and irregularly forked throughout. Colour a fine rose-red. Substance between membranaceous and cartilaginous. This species looks not unlike poor specimens of Plocamium coccineum without the comb-like ramuli, but

the *structure* of the frond when examined under the microscope appears very similar to Ceramium. Grows on other algæ. Very rare. Annual. Producing fruit in September and October. South of England and east coast of Ireland. Budleigh Salterton. Exmouth, "thrown up from deep water in December, with tetraspores, very luxuriant and robust, also much darker than in the summer state," Mrs. Gulson. Torquay, Mrs. Griffiths. Teignmouth. Mount Edgecumbe. Plymouth, Rev. W. S. Hore. Gwyllyn-vase Bay, Falmouth, "local, but at times plentiful," Miss Warren. Bray, Co. Wicklow. Kingstown.

CERAMIUM.

Name meaning a *pitcher*.

Frond filiform, one-tubed, articulated. "The dissepiments coated with a stratum of coloured cellules which sometimes extend over the surface of the articulation." *Fructification*: 1. roundish *favellæ*,



W. Dickes, Litho.

Fig 1. CERAMIUM RUBRUM

2. CALLITHAMNION TETRACONUM.

Fig 3. CLADOPHORA RUPESTRIS.

„ 4. ENTEROMORPHA COMPRESSA

containing minute spores; 2. *tetraspores* either immersed in the ramuli, or more or less external.

SECTION 1.—Rubra. Smooth; the whole surface of the articulation covered with coloured cells.

CERAMIUM RUBRUM.—RED CERAMIUM.

Frond from two to twelve inches high, very variable in its branching, irregularly forked, with many or few side ramuli which are either secund or forked. Favellæ mostly on the side branchlets, set round with three or four ramuli. Tetraspores immersed in the articulations. This is one of the most puzzling plants to the young botanist, varying as it does so greatly in ramification and colour; its natural hue is a clear red, but in shallow pools near high water-mark it is often brownish or yellowish. Very frequent on our shores, growing on stones and algæ in tide-pools, and in four to five fathoms water. Annual. Summer and Autumn.

CERAMIUM BOTRYOCARPUM.—GRAPE-FRUITED CERAMIUM.

Filaments curved at the base, ramuli numerous, mostly simple or once-forked. Favellæ in clusters, without surrounding ramuli, colour a purplish red, often fading to green and yellow. "This is known from C. rubrum by its remarkable fruit, consisting of a great number of favellæ, without involucre, heaped together like bunches of grapes. The colour is generally darker and more purple than C. rubrum, and the tips of the branchlets are straight." These, according to Dr. Harvey, are the principal characters on which it is proposed to establish the species. Grows on rocks and algæ between tide-marks. Discovered by Miss Amelia E. Griffiths in 1844, in great plenty on Preston rocks near Torquay; every subsequent season it has been met with in equal abundance. Annual, in perfection in June and July. Ardrossan, Ayrshire.

SECTION 2.—Diaphana. Smooth, the surface of the articulation usually bare, or but partially covered with coloured cellules, leaving a colourless space in the centre.

CERAMIUM DECURRENS.—PARTIALLY TRANSPARENT CERAMIUM.

"Frond robust, gradually attenuated upwards, dichotomous, with few lateral branchlets, the apices hooked inwards, articulations partially coated with coloured cellules, which extend from the dissepiments at each end, but leave a colourless, pellucid space in the centre of the articulation; lowermost articulations twice as long as broad, upper very short." Harv. Man., Ed. 2, p. 162. This species differs from C. rubrum in having the *centre* of the joint transparent, but the cells are continued *part way* down the joint, a character which separates it from C. diaphanum. Mrs. Griffiths does not consider this a very satisfactory species. Grows on

rocks, in tide-pools. Annual. August. Torquay, on the Harbrick.

CERAMIUM DESLONGCHAMPII.—DESLONGCHAMP'S CERAMIUM.

Tufted, from three to four inches high, much branched, more or less forked throughout; tips of the ramuli spreading. Dissepiments dark purple; articulations transparent; in the main stems about thrice as long as broad, much shorter in the ramuli. The colour of this species to the naked eye is a very dark purple, and the articulations are scarcely visible excepting in the stems. "Favellæ without any involucral ramuli, very irregular in form and size; *tetraspores* large and very prominent, seated in the joints, *often of the same plant which bears 'favellæ.'* "—Harv. Grows on other algæ between tide-marks. Perennial. Not uncommon in many places. Pier, Torquay. Blue Anchor, Minehead, and Bossington, Somerset, frequent; I. G. Ulverstone, Lancashire, Miss E. Hodgson. Swansea. Belfast

Bay. Dublin Bay. At Balbriggan, &c., "very abundant."—Dr. W. H. Harvey. Frith of Forth. Ardrossan.

CERAMIUM DIAPHANUM.—LARGE, TRANSPARENT-JOINTED CERAMIUM.

From two to six inches high, irregularly forked, branches set with lateral small forked ramuli; articulations pellucid, very evident, three or four times as long as broad in the main stem, much closer in the ramuli, dissepiments dark-coloured, swollen. Tips of the ramuli hooked inwards. Favellæ near the tips of the branches, with involucral ramuli; tetraspores immersed, in whorls round the joints. Dr. Harvey, in his remarks on this plant in the *Phycologia Britannica*, says:—"From the British species of this section, except one, our *C. diaphanum* may be at once known by its larger size and more robust filaments; it is also well characterized by the lateral dichotomous ramuli given off all along the principal divisions of the frond, and by the gradu-

ally attenuated filaments. These last characters distinguish it from *C. nodosum* and *C. fastigiatum*. Though existing on all our coasts, from north to south, it does not appear to be very abundant anywhere, seldom growing in society; the tufts being thinly scattered here and there though the rock-pools. When growing, few algæ are more delicately beautiful; and even in a dry state it forms a very handsome object, the brilliancy and regularity of the dot-like joints, connected by hyaline, glistering spaces, having the effect of a piece of fine tracery." Grows on the smaller algæ in tide-pools, sometimes on rocks. Annual. Summer. Found on the British coasts from Orkney to Cornwall.

CERAMIUM GRACILLIMUM.—GRACEFUL SLENDER-BRANCHED CERAMIUM.

"Frond excessively slender, of nearly equal diameter throughout, very flaccid and gelatinous, dichotomous; the branches set with minute, flabelliform, dichotomous ramuli; articulations colourless,

those of the branches five or six times as long as broad, those of the ramuli very short; dissepiments opaque, purple; favellæ borne on the lateral ramuli with a spreading many-rayed involucre.

C. gracillimum has a softer and more gelatinous substance than any British *Ceramium*, and this character, with its extreme tenuity, and the minute, fastigiate lateral branchlets, readily distinguish it from any of the section to which it belongs. So slender are its threads, so flaccid, and so densely crowded together, that it is almost impossible to display them properly on paper. They almost invariably become entangled together, and it is in vain to attempt their disentanglement. *Harv. Phyc. Brit.* Grows on *Corallina officinalis*, and other algæ. Sometimes attached to mussel-shells near extreme low water-mark. Annual. September. Kilkee, "covering a very large surface of rock, growing on the stunted fronds of *C. officinalis*."—Dr. W. H. Harvey. Plymouth. Penzance. "Probably common."

CERAMIUM STRICTUM. — CLOSE-FORKED TRANSPARENT-JOINTED CERAMIUM.

"Frond capillary, nearly equal, membranaceous, irregularly dichotomous, the lower forkings distant, the upper, closer; all the divisions erect and straight, with narrow, acute angles; the apices straight, or slightly hooked inwards; articulations colourless, those of the stem and branches three to four times as long as broad, of the ramuli short; dissepiments opaque, purple; favellæ near the tips of the branches involucrate; tetraspores, bursting from the dissepiments of the larger branches. The frond is more slender than in *C. diaphanum*, and much more robust than in *C. gracillimum*." This species grows in dense tufts, the filaments all spreading out very straightly, and dividing into pencilled tufts near the tips; the colour of the tuft is either a dark livid purple, or yellowish purple when growing exposed to the sunshine. Attached to mussell-shells, &c., in tide-pools. Annual. Sum-

mer. Dingle and Roundstone Bay, West of Ireland. Torquay. Plymouth, Mr. Boswarva.

CERAMIUM NODOSUM.—WIDE-FORKED TRANSPARENT-JOINTED CERAMIUM.

Fronds three to six inches long, as fine as human hair, or more slender, forming globular, fastigiate tufts, repeatedly dichotomous, with very patent axils, of nearly equal diameter throughout. Dissepiments swollen, dark-coloured; articulations colourless. Substance rigid and harsh to the touch when recent. In drying it adheres but imperfectly to paper. The wide-spread forkings of the branches and harsher substance distinguish this species from the following. Grows on sandy shores, often at the roots of Zostera. Annual. Summer. Dublin Bay. Ireland's Eye. Bangor and Newcastle, Co. Down. Howth. Rathmullar. Roundstone Bay, Cunnemara. Isle of Wight. Meadfoot, near Torquay. Plymouth. Falmouth.

CERAMIUM FASTIGIATUM.—SOFT-TUFTED CERAMIUM.

"Filaments four or five inches high, very slender, nearly of equal diameter throughout, regularly dichotomous from the base; the lower axils distant, the upper very close, many times forked; the apices fastigiate and hooked inwards. Lower articulations generally three or four times as long as broad, colourless; upper very short, rosy; dissepiments opaque, swollen, purple. Substance tender and flaccid. Colour of the tuft pinky purple. Grows on rocks, &c., in tide-pools, rare."—*Harv.* Torquay, &c. Plymouth. Frith of Forth.

Section 3.—Ciliata: frond armed at the dissepiments, with one or more prickles, or bristle-like hairs.

CERAMIUM FLABELLIGERUM.—FAN-LIKE BRANCHED CERAMIUM.

To the naked eye the minute prickle which springs from the outer edge of each joint is not apparent, and without microscopic examination of this species, it is not very easy to distinguish it from Ceramium rubrum, which it nearly resembles in many respects. The *colour* in this is more of a dark purple than a red, and exactly similar to that of Polysiphonia fastigiata. The upper branches in C. flabelligerum in well-grown plants are much divided, and spread out in somewhat of a fan-shaped manner; the filaments are finer than in *C. rubrum*, and the size of the full-grown tuft is never above three or four inches in height. In old or imperfectly-developed plants the spines are often deficient; still a few may be always detected on the ramuli near their tips; the articulations are entirely covered with coloured cells as in C. rubrum, but they are rather larger in this species, and the articu-

lations are slightly different in shape. Grows on the smaller algæ, between tide-marks. Probably frequent. Annual. Summer and autumn. Mrs. Griffiths, in a letter addressed to me, writes:—"I have no doubt but C. flabelligerum is a very common species, but has been overlooked as a bad state of C. rubrum, for which I have myself often thrown away fine plants in former days. Few specimens have the spines so plentiful as ours on this coast, where the tufts reach the height of four or five inches." On the Somerset coast, I find it growing on algæ in tide-pools at Blue Anchor, and frequent on wood-work on the beach at Minehead. Pentire, North coast of Cornwall, Miss Warren. Dover, Mrs. Sillery. Whitehaven, Lancashire, Miss Parker. Ulverstone, Miss E. Hodgson. Downshire coast. Jersey.

CERAMIUM ECHIONOTUM.—IRREGULARLY-SPINED CERAMIUM.

Forms rather rigid, tufts of a dark red or purple

hue; the joints are transparent, but in young plants the upper ones are filled with a purplish fluid, which prevents the pellucid nature of the articulation being seen until the plant is dried. The *irregularly* scattered, *slender*, needle-shaped prickles which surround the dissepiments form the distinguishing mark in this species. Grows attached to rocks and stones between, or parasitic on, various algæ in tide-pools. Annual. Summer and autumn. Common in several places Torbay. Plymouth. Falmouth. Minehead, Somerset, a few plants drifted ashore during the summer of 1850, I. G. Youghal. North and west of Ireland.

CERAMIUM ACANTHONOTUM.—UNILATERAL SPINED CERAMIUM.

Grows in tufts of a very dark purple colour, from two to six inches in height, much matted together, tips of the ramuli rolled inwards; articulations pellucid, dissepiments coloured, with broadly

awl-shaped prickle, springing from the outer edge. This last character separates it from C. echionotum, in which the spines are scattered all *round* the joint, "pointing in various directions, like the spines of a sea-urchin;" likewise C. ciliatum, the spines form a *regular* whorl round the joint, and from *C. flabelligerum*, the only other species with unilateral spines, it may at once be known by its *transparent* articulations, and its very different growth. Grows on exposed rocks near low water-mark, and on the smaller algæ. Annual. Summer and autumn. Not uncommon. Torbay. Plymouth. West of Ireland, common. Youghal. Appin, Argyleshire. Aberdeen.

CERAMIUM CILIATUM.—REGULARLY-WHORLED CERAMIUM.

Grows in dense bundled tufts, of a paler purple than the preceding plant, and known from C. echionotum by its *regular* whorl of prickles, all *pointing upwards*, and not irregular, inserted and

pointing in all directions as in that species. Grows attached to rocks and stones, and parasitic on the smaller algæ in tide-pools. Annual. Summer. Not uncommon.

SPYRIDIA.

Name signifying a *basket*, in allusion to the form of the receptacles.

Frond filiform, cylindrical, much branched, ramuli bristle-like, simple, jointed. *Fructification*: 1. stalked, lobed, *favellæ* surrounded by short ramuli; 2. external *tetraspores*, attached to the ramuli.

SPYRIDIA FILAMENTOSA.—FILAMENTOUS SPYRIDIA.

"Stems tufted, many rising from a broadly expanded disk; thick, two to eight inches high; irregularly branched, cartilaginous, densely cellular,

with an obscure appearance of articulation; branches beset with short, hair-like, simple or subdivided, scattered ramuli. Colour a dull red, fading to brownish."—*Harv. Man.* Grows attached to rocks between tide-marks. Southern shores of England. Jersey. Holyhead. Aberfraw, Anglesea; plentiful.

GRIFFITHSIA.

Named in honour of Mrs. Griffiths, of Torquay, Devon, whose many discoveries in and intimate knowledge of the marine algæ are so well known to all Algologists.

Frond rose-red, filamentous; filaments articulated throughout, mostly dichotomous; ramuli single-tubed, often whorled; dissepiments hyaline. *Fructification:* 1. roundish gelatinous, *receptacles* (favellæ), containing minute spores; 2. *tetraspores* affixed to whorled ramuli.

GRIFFITHSIA EQUISETIFOLIA.—EQUISETUM-LIKE GRIFFITHSIA.

From three to eight inches high, thickly set with short incurved bristle-like ramuli, not unlike Cladostephus verticillatus, but the colour is different, and it is either of a red or brownish hue, often staining the paper on which it is dried, a beautiful pink. Perennial. Summer. On the shores of England, the west of Ireland, and Channel Islands. Frequent. Rare in Scotland. Frith of Forth, very rare.

GRIFFITHSIA CORALLINA.—CORALLINE-LIKE GRIFFITHSIA.

From two to four inches high, very unlike the former species in aspect; the joints are very distinct, swollen upwards like those of a Coralline, and filled with a red liquid, staining the paper on which the plant is preserved, a fine red colour. *Tetra-*

spores minute, whorled round the joint near the tips of the branches; favellæ, roundish on the sides of the ramuli. Substance tender and gelatinous. The filaments are repeatedly and regularly forked with wide-spreading axils. Brighton. Weymouth. The Channel Islands. Falmouth Harbour, plentiful, I. G. Hartly, Northumberland. Dublin Bay. Portrush. Cork Harbour. Belfast Lough.

GRIFFITHSIA SETACEA.—BRISTLE-LIKE GRIFFITHSIA.

From three to six inches high, filaments finer and with much smaller joints than in G. corallina. Slender, irregularly forked, with acute axils. Rather rigid, of a beautiful crimson when recent, but immediately on its being immersed in fresh water, the membrane bursts with a cracking noise, and the colouring is lost; like several others of the genus, it stains paper of a bright carmine, which will remain unaltered for years. *Tetraspores* borne on involucre-like ramuli. *Favellæ* also attached to

involucral ramuli. Grows on rocks &c., between tide-marks, not uncommon near low water-mark. Perennial.

O. S. *G. simplicifilum.* On rocks near Black Castle, and among rejectamenta at Ardinairy Point, Co. Wicklow. "Obtained plentifully at Freshwater Bay, Isle of Wight, in August, 1841, by Messrs. R. Ball and W. Thompson."—*Report of British Assoc.* for 1846. Coast of Norfolk, Rev. W. S. Hore. Very rare. Differs from G. equisetifolia in its more attenuated branches and much brighter, pinky-red colour. The ramuli are only once-forked in this, while in G. equisetifolia they are many times dichotomous.

G. barbata. Thrown up by the sea, extremely rare. Brighton Beach. Growing on algæ in rock-pools at Jersey, Miss Turner. A beautiful and slender species, furnished at the upper joints with whorls of very slender ramuli, "resembling the byssoid fibres of a Polysiphonia;" on these the tetraspores are borne.

G. Devoniensis. Muddy sea shores in deep

water. Rare. Plymouth, Rev. W. S. Hore. Salcombe, Devon, Mrs. Wyatt. "Involucres of tetraspores whorled round the dissepiments of the branches. This is an exceedingly slender plant, densely tufted, and of a fine rosy red colour. The small size of the filaments distinguish it from G. corallina, and the different arrangement of the fruit from G. barbata and G. setacea."

G. secundiflora. "On rocks at extreme low-water-mark. Very rare. Discovered at Bovisand near Plymouth, by the Rev. W. S. Hore, 1846. Filaments tufted, four to eight inches in height, thicker than hog's bristles, not sensibly attenuated upwards. From G. setacea this plant may at once be known by its large size, its comparatively shorter joints and more lubricous substance, but especially by the very obtuse, cylindrical upper ramuli, which do not taper to a point, but are of a very equal diameter throughout. From G. corallina, which in many respects it resembles, its cylindrical articulations and different inflorescence distinguish it."—*Harv. Phyc. Brit.*

WRANGELIA.

Name in honour of Baron von Wrangel, a Swedish Naturalist.

Frond purplish or rose-red, filamentous, jointed; filaments single tubed. *Fructification:* 1. gelatinous *receptacles* (*favellæ*) terminating the branches, surrounded by an involucre, and containing spores compacted together. 2. *tetraspores*, affixed to the ramuli, scattered.

WRANGELIA MULTIFIDA.—WHORLED WRANGELIA.

From four to six inches high, articulated, opposite multified or whorled ramuli spring from each joint; in the variety β *pilifera* these are much lengthened, half an inch long, and either simple or pinnate. The joints of the stem are much longer than broad, but vary much in length in different specimens. Tetraspores on the ramuli either oppo-

site or secund, minute. Favellæ stalked, roundish, with whorled ramuli. Colour rose-red, soon given out in fresh water. Substance soft, adhering closely to paper. Grows on perpendicular rocks near low water-mark. Annual. Summer. Frequent on the south coasts of England. Var. *pilifera*, at Torquay. West of Ireland. Belfast Bay. Rare in Scotland. Saltcoats, Ayrshire, Miss M. Landsborough.

SEIROSPORA.

Name meaning a *chain* and a *seed*.

"*Frond* rosy, filamentous; stem articulated, one-tubed; the articulations traversed by jointed filaments; branches jointed. *Fructification*: 1. *favellæ* (unknown); 2. oval *tetraspores*, disposed in terminal, moniliform strings."—*Harv.*

SEIROSPORA GRIFFITHSIANA.—GRIFFITHS' SEIROSPORA.

Stem two to six inches high, setaceous, generally undivided, more or less opaque and veiny, set with numerous sub-distichous, long, simple, alternate patent branches, the lowest of which are longest, giving the plant, when displayed, a broadly ovate outline; the largest frequently bearing a second set of similar branches. This beautiful plant has the aspect, and many of the microscopic characters of strong specimens of *Cal. corymbosum*, but is at once distinguished by the fructification; the tetraspores in Seirospora being formed out of the terminal ramuli themselves, the whole ramulus becoming converted into a string of bead-like tetraspores."—Harv., Man., Ed. 2nd, p. 171.

Grows on rocks and algæ, in from four to five fathom water. Very rare. Torquay. Salcombe. Torpoint, Plymouth. Roundstone Bay, Galway. Portaferry.

CALLITHAMNION.

Name meaning a *beautiful shrub or plant.*

"*Frond* rosy or brownish red, filamentous; stem either opaque and cellular, or translucent or jointed; branches jointed, one-tubed, mostly pinnate (rarely dichotomous or irregular); dissepiments hyaline. *Fructification:* 1. roundish or lobed, berry-like *receptacles* (*favellæ*) seated on the main branches, and containing numerous, angular spores; 2. external *tetraspores,* scattered along the ultimate branchlets or borne on little stalks."—*Harv.*

CALLITHAMNION PLUMULA.—FEATHERY CALLITHAMNION.

From two to five inches high, articulated throughout: at each joint arise a pair of small *opposite* ramuli; these when examined by the help of a pocket lens will appear pectinated along their inner margins with pinnules, which in fine grown

plants are often again pectinated in a similar manner.

Branches either alternate or irregular, upper ones usually longest; the appearance of the plant when in water is beautifully delicate and feathery. Colour a rich red. Substance soft and flaccid. Found all along our coasts from Orkney to the Land's End. β is a variety smaller in every part.

CALLITHAMNION TETRAGONUM.—SQUARE-BRANCHED CALLITHAMNION.

Fronds three to six inches high, stem obscurely jointed and nearly opaque; "repeatedly branched alternately, the branches irregularly quadrifarious, the lowest longest, and set with one or more series of lesser branches, the upper gradually shorter and more simple; the general outline of the frond being ovate, with its principal divisions tapering to the apex." Substance much firmer than in the preceding species. Colour, pink or reddish brown. *Favellæ* either placed singly or in pairs, large.

Tetraspores very minute, secund on the upper ramuli. Grows on the larger algæ near low water-mark, frequent. Annual. Summer.

CALLITHAMNION BRACHIATUM.—SLENDER SQUARE-BRANCHED CALLITHAMNION.

This plant very much resembles C. tetragonum, but differs from it in outward character in its more slender habit and lanceolate outline; microscopically it is distinguished by the ramuli *gradually* tapering to a fine point, and not as in that species suddenly acuminate. It is found in the same situations as the C. tetragonum, and is equally common.

CALLITHAMNION BORRERI.—BORRER'S CALLITHAMNION.

From less than half an inch to four or five in height, tufted, much branched; branches set with plumules which are without ramuli along their

lower half; this forms the distinguishing mark of the species. Colour a rose-red when well coloured, but often brownish red. Grows on mud-covered rocks near low water-mark. Annual. Summer. Rather rare. Yarmouth. Sidmouth. Torquay. Very fine at Plymouth. Falmouth. Land's End. Swansea. Ilfracombe. Coast of Somerset, Clevedon, Blue Anchor Bay; and common on wood-work at Minehead, I. G. It is the only species of the genus besides C. Rothii that I find in a growing state on the shores of the Somerset portion of the Severn Sea. East coast of Ireland. Clontarf. Howth.

CALLITHAMNION CORYMBOSUM.—CORYMBOSE CALLITHAMNION.

From one to three inches high; though small, this plant may be distinguished by the naked eye from other species, by the *corymbose* or level-topped appearance of the branchlets. Colour rose-red. Very slender and capillary; flaccid, adhering closely

to paper. Not uncommon on algæ near low water-mark and on rocks.

CALLITHAMNION FLORIDULUM.—TUFTED CALLITHAMNION.

Filaments slender, forked, without ramuli, forming dense tufts. *Tetraspores* on short stalks arranged in a secund manner along the upper branches. Grows on sand-covered rocks, near low water-mark, at all seasons. Perennial? March and April. Abundant on the Galway coast, east of Ireland, on the coasts of Clare and Kerry. Antrim. Orkney. Falmouth, I. G. Land's End. The tufts of this species, washed ashore on the west coast of Ireland, are, we are told, called *figs* by the country people, and collected as manure.

SUMMARY OF THE SPECIES OF THE CALLITHAMNION GENUS.

SECTION 1.—Cruciata. Ramuli opposite.

C. plumula. Grows on rocks and algæ near low water-mark, and to the depth of four to fifteen fathom water. Annual. Summer and autumn. Not uncommon. From each joint arises a pair of small opposite ramuli, recurved and pectinated on their inner sides.

C. cruciatum. Grows on mud-covered rocks near low water-mark. Rare. Abundant on the pier at Torquay. Salcombe. Plymouth. Milford Haven. Cork Harbour. Ferriter's Cove, Kerry. Coast of Down. *β pumilum,* Miltown Malbay. Two opposite or four cruciate slender erect pinnated ramuli arise from each joint; ramuli in very dense tufts at the tips of the branches. *β pumilum* is a much smaller form, with shorter joints and more dense ramuli.

C. floccosum. Grows on submarine rocks near low water-mark. Annual. Spring. Very rare.

Orkney Islands. Aberdeen. Densely tufted, one to five inches in height, slender, and flaccid; every joint produces a pair of opposite and simple awl-shaped minute spreading ramuli.

C. Turneri. Parasitical on several marine algæ. Grows in tufts of an inch to an inch and a half in height; simple or slightly branched, pinnated, with opposite spreading simple ramuli.

C. barbatum. Grows on mud-covered rocks within tide-marks. Very rare. Dredged at Weymouth. Quay, at Penzance. Ilfracombe. Filaments densely tufted, one to two inches high; branches simple or pinnulated for half their length, with minute opposite ramuli. Tetraspores elliptic-oblong.

C. pluma. Grows on other algæ, usually on the stems of *Laminaria digitata.* Rare. Bantry Bay. Malbay, west of Ireland. Appin, Argyleshire. From a quarter to half an inch in height; branches usually alternate, naked below, the upper half pinnated, with short erect close-set opposite ramuli. Tetraspores globose.

SECTION 2.—Fruticosa. Ramuli alternate. Main stems robust, opaque, or nearly so.

C. Arbuscula. Grows on exposed rocks, and on stones and shells between tide-marks. Perennial. Common on the northern and western shores of Scotland and Ireland. Very rare. On the eastern shores of Scotland. Frith of Forth. Aberdeen. Not known on the English shores. From three to eight inches high; destitute of branches in the lower part of the stem; main branches set with shorter ones, which are densely clothed with finely divided ramuli. Colour a dark or brownish vinous red colour.

C. Brodiæi. Grows on other marine algæ. Rare. Forres, coast of Northumberland. Torquay. Mouse-hole, near Penzance. Miltown Malbay, west of Ireland. Annual. Spring. From one to three inches high; set throughout the whole length of the stem with long, simple, quadrifarious branches, the lower ones being the longest, the higher becoming gradually shorter; pinnules erecto-patent. Colour a brownish red.

C. testragonum. See description.

C. brachiatum. Ditto.

C. tetricum. Grows in tide-pools on other algæ, or more frequently on perpendicular faces of rock, at half-tide level. Perennial. Common on the rocky coasts of England, and the west and south of England. Abundant at Swansea. Sometimes cast ashore at Minehead, Somerset, I. G. Falmouth, "not very frequent," Miss Warren. Channel Islands. Lambay. Fronds two to eight inches long, rigid, with straight pinnated ramuli. Colour a dull dark-brown red. Substance harsh, scarcely adhering to paper.

C. Hookeri. Grows on rocks and algæ between tide-marks, and at a greater depth. Dispersed along the British shores from Orkney to Cornwall, and in Ireland. Not uncommon. Annual. Spring and summer. From one to three inches high; stem *opaque*, bristle-like, simple; branches flexuous, with patent or divaricated ramuli. Colour a brownish or rosy-red. "Specimens from North Devon and the south of Ireland are much more robust and deep

coloured, and of a less delicate substance than those from Torbay and the east of Ireland. and at first strikingly resemble *C. Brodiæi*, while the latter come nearer *C. roseum*."

SECTION 3.—Rosea. Main stems slender, evidently articulated.

C. roseum. Grows on mud-covered rocks and algæ near low water-mark. Annual. Summer. Not uncommon. Yarmouth. Torquay. Plymouth, very fine. Falmouth. Bantry Bay. Arran, co. Clare. Three to four inches high, much branched; pinnules long, spreading, nearly simple, curved. Colour, when young, a fine purplish red, brownish when old.

C. byssoideum. Grows on other algæ near low water-mark. Not very uncommon. Devonshire. South coast of Cornwall. Portaferry, Strangford Lough. Dublin Bay. Cork Harbour. Very flaccid, much divided, branches often entangled together. This has the habit and substance of *C. corymbosum*, but in ramification it nearly agrees

with *C. roseum*; the filaments are, however, much finer and more delicate than in that species.

C. polyspermum. Grows on rocks and the larger fuci. Not uncommon. Annual. Spring and summer. Sussex coast. Torquay. Plymouth. Mousehole, near Penzance. North of Ireland. Dunree, Donegal, Youghal. Appin, Argyle. Tufts globose; stems nearly simple below, much branched in a fan-like manner above. "Plumules linear-oblong in outline; pinnæ short, simple, patent, acute, spine-like." Colour a dull rose-red or purplish.

C. purpurascens. "Gathered on the Brighton beach by Mr. W. Borrer. Purplish-red, repeatedly branched, very slender and tufted."—Smith, E. Bot. t. 2465.

C. fasciculatum. At Yarmouth. "Tufted, branches erect, flexuous, level-topped; plumules elongate, erect, linear-obovate, truncate. Colour a fine purple red." This Dr. Harvey now considers a very doubtful species, probably one of the varieties of *C. Borreri.*

C. Borreri. See description.

C. affine. Shores of Bute, on fuci. Much branched; two or three inches high; plumules short, very narrow. Colour a deep red. This is a doubtful species.

C. tripinnatum. Grows on rocks at extreme low water-mark. Annual. April and May. Very rare. Roundstone Bay, Galway. Plymouth. Frond capillary, in *habit* resembling C. gracillimum, but resembling, in its microscopic characters, C. Borreri, from which it is known by the minute ramulus which springs from the first joint of the pinnæ. Colour a fine crimson. Substance closely adhering to paper.

C. gracillimum. Grows on mud-covered rocks near low water-mark. Exmouth, Mrs. Gulson. Pier, Torquay. Falmouth Bay. Plymouth abundantly. Milford Haven. From one to four inches high, very slender, distichously branched; upper plumules long, narrow-ovate or lanceolate-patent, twice or three times pinnate. Colour a beautiful rose-red.

C. thuyoideum. Grows on rocks near low water-

mark. Rare. Pier, Torquay. Plymouth. Falmouth. Whitsand Bay, near the Land'sEnd. Ilfracombe. Swansea. Yarmouth. Portaferry, near Belfast. Wicklow. Roundstone Bay, Galway. From one to two inches high. Plumules twice-pinnate patent, narrow linear-oblong in outline. Colour a fine rose-red.

SECTION 4. — Corymbosa. Stems articulated; ramuli dichotomous.

C. corymbosum. See description.

C. spongiosum. Grows on rocks in the sea, generally such as are perpendicular, and on other algæ. South of England, and coasts of Ireland and Scotland. Torquay. Salcombe. Plymouth. Land's End. Ilfracombe. Jersey. Kingstown harbour and Killiney. Dunleary. Larne. Saltcoats. Largo. Kilbride, Ayrshire. Fyfe.

"Fronds two to four inches high, flaccid, soft, holding water like a sponge; stems shrubby; branches long, spreading in every direction, thickly clothed with short secondary branchlets about half

an inch in length, which are again covered with a third set which are dichotomously divided, and, spreading on all sides, give the plant a rounded bushy character. To the naked eye this plant has something the habit of C. arbuscula, while, in its microscopic characters, it comes nearer C. corymbosum. It is, however, a much coarser plant than the latter, void of gloss when dry, and of duller colour."—Harv. Man., p. 182.

C. pedicellatum. Grows on rocks, &c., near low water-mark. Not uncommon. Two to eight inches high; stems bristle-like; branches naked, or set with short, alternate, somewhat tufted, sparingly-forked branchlets. Colour a fine red, quickly given out in fresh water, and becoming a dull brown when dry.

SECTION 5.—Pulvinata. Filaments short, densely tufted, forming cushion-like tufts, or spreading in velvety patches.

C. Rothii. Spreads over the surface of rocks about half-tide level, and also grows on woodwork

in the same situations. Perennial, bears fruit in winter. Filaments slender, short, erect, much smaller than in C. floridulum, and distinguished from it by the clustered arrangement of the tetraspores, which in that species are borne singly, and in a secund manner along the branches. Colour a dull red. Height of the filaments never above half an inch.

C. floridulum. See description.

C. mesocarpum. Rocks at the extremity of low water-mark. Appin, Argyleshire.—"Tufts contiguous, forming a broad shaggy purple crust." Filaments minute; branches virgate. Tetraspores crowded about the middle of the filaments on forked peduncles, secund or opposite.

Section 6.—Parasitica. Minute parasites.

C. sparsum. On old stems of Laminaria saccharina at Appin, Argyle. On Conferva rupestris at Miltown, Malbay. Scarcely a line high. "Tetraspores obovate, sessile, mostly axillary." It is better distinguished, Dr. Harvey says, from

C. Rothii by its minute and scattered habit, than by any peculiarity of branching; the fruit is, however, very different.

C. Daviesii. Parasitical on the smaller algæ, generally on Ceramium rubrum. Filaments two or three lines high, forming elegant pencilled tufts.

SERIES III.

CHLOROSPERMEÆ.

THE GRASS-GREEN SERIES.

Plants of a grass-green, rarely purple colour; growing in the sea, in fresh water, or in damp situations. *Fructification:* "1. *spores* green or purple, formed within the cells, often at maturity vivacious, moving by means of vibratile cilia; 2. *coniocystæ*, or external vesicles, containing a dense, dark coloured mass, and finally separating from the frond."

ANALYSIS OF THE TRIBES.

1 { Fronds filamentous, articulate — Confervaceæ.
  { Fronds not articulate 2

2 { Fronds composed of one continuous cell, either filamentous, simple, or densely interwoven together, or filiform and branched. — Siphonaceæ.
  { Fronds flattened, or tubular, consisting of many-sided cells, cohering together. — Ulvaceæ.

Many of the species comprised in this division of the algæ are not marine plants, but inhabitants of our fresh-water pools and ditches; others are found in moist situations, on damp ground, rotten wood, and among mosses.

The remarkable voluntary action manifested by the spores of the Conferveæ, and of other plants belonging to this series, has excited much attention abroad,

where the opinion generally prevails that the spores on their liberation from the main filament, become animalcules. M. Agardh,* in his account of Conferveærea, describes the *sporules* as being furnished with a little beak, or anterior process, distinguishable from the body of the seed by its paler colour, and he considered that it was on the vibrations of this beak that the motion depended. More recently, M. Thuret† has discovered that the spores of many among the fresh-water species are furnished with cilia which vibrate in the same manner as do the cilia of the Infusorial animalcules. The spores of the Conferveæ possess two cilia; on those of Chætophora they form a circle, and the spores of Vaucheria are completely covered with them. The spores of the majority of grass-green algæ, when examined with high magnifying powers, are now found to be clothed with cilia, and to manifest these seemingly voluntary movements, which cease as soon as the spore reaches a substance on which it can rest

* See "Manual of British Algæ." Introduction, p. 31.

† See "Botanique," par M. Adrien de Jussieu, p. 461.

and attach itself. Thus we find plants that are termed of a simple structure and low organization, presenting phenomena which baffle the researches of the scientific inquirer, and leave the naturalist in doubt whether he be observing the motions of an animalcule or those of a plant; but which cannot fail to impress him with the wonderful care and provision shown for the continuance of these humble weeds, evincing, as they do so clearly and forcibly, that they have been cared for by a good and beneficent Creator, whose eye is over all His works.

SIPHONACEÆ.—SYPHON TRIBE.

Green, marine or fresh-water algæ, composed of continuous, tubular, simple, or branched filaments, free or variously combined in cylindrical or expanded fronds.—*Harv.*

The filaments of these algæ are remarkable for consisting of a single tube, or lengthened cell, filled with colouring matter, without any internal par-

titions. "Thus if a whole frond of Bryopsis plumosa be placed on a piece of glass, under water, and the tip of one of its branches be wounded, the contents of the frond may be pressed out through the lacerated part, leaving nothing but an empty skin, and showing that there is no internal diaphragm in any part of the tube." In Codium the filaments are woven together into fronds of spongy substance and various forms.

Bryopsis, though of simpler structure, appears more perfect, from the regularity and beauty of its pinnate fronds, resembling tufts of miniature green feathers. The filaments in Vaucheria are densely tufted, and often intertwined together, forming cushion-like tufts. Many of the species are found in ponds, ditches, and on damp earth; the *marine* kinds alone are described in this work.

MARINE GENERA OF THE SIPHONACEÆ TRIBE.

Codium. Filaments closely combined into a sponge-like frond.

Bryopsis. Filaments free, pinnately branched.

Vaucheria. Filaments free, irregularly branched.

CODIUM.

Name meaning the *skin* of an animal, from the soft shaggy substance.

Frond spongy, dark-green (crustaceous, globular, cylindrical, or flat), composed of an interwoven mass of tubular, continuous filaments. *Fructification:* opaque vesicles attached to the filaments near the surface of the frond.—*Grev.*

CODIUM TOMENTOSUM.—FORKED-SPONGY CODIUM.

Frond six to twelve inches long, spongy, cylindrical, and more or less regularly forked. Structure

filamentous, composed internally of colourless interlaced fibres, outwardly of minute, club-shaped, deep green filaments. Fructification, ovate vesicles seated on the outer filaments. Perennial. Summer. Grows on rocks in the sea. Frequent.

O. S. C. Bursa. Grows on rocks in the sea. Very rare. Perennial. Summer. According to *Pallas*, growing plentifully on the Sussex coast, but has not been obtained of late years from thence, except by Mr. Pyke, collector and vendor of algæ specimens at Brighton. Penzance Bay, near Falmouth, Mr. W. P. Cocks, rare. Shores of Cornwall. Near Torquay. Belfast. Frond a globular hollow ball, one to eight inches in diameter. Structure the same as that of C. tomentosum.

C. adhærens. Grows on rocks, near low-water. Very rare. Annual. Torquay. Falmouth Bay, "sparingly," Miss Warren. Falmouth Harbour, "scarce," and Penzance Bay, "not uncommon," Mr. W. P. Cocks. Sennen Cove, Land's End. Gorran Haven, and Gerran's Bay, Cornwall. Rathlin Island, Antrim. Tory Island. This species

spreads over the rock in patches of two feet or more in extent, "resembling," says Mrs. Griffiths, fragments of beautiful green velvet.

C. amphibium. On turf banks, near high water, but exposed to every tide, at Roundstone, and at the head of Birtirbui Bay, Galway; discovered there by the late Mr. William M'Calla. "Fronds minute, erect cylindrical, aggregated in widely-spreading strata. Colour a brilliant green, substance soft."—*Harv.*, Man., 2nd edition, p. 194.

BRYOPSIS.

Name meaning *moss-like.*

Frond membranaceous, filiform, tubular, cylindrical, glistening, branched; the branches imbricated or distichous and pinnated, filled with a fine green minutely granuliferous fluid.—*Grev.*

BRYOPSIS PLUMOSA.—FEATHERY BRYOPSIS.

Frond from one to four inches high, with scattered branches, which are naked at base and closely set in the upper part, with slender pinnated ramuli. Substance slippery, adhering well to paper. Colour a fine green. A very elegant and beautiful species, not uncommon on rocks, &c. in tide-pools. Annual. Summer and autumn.

BRYOPSIS HYPNOIDES.—HYPNUM-LIKE BRYOPSIS.

Fronds densely tufted from two to six inches long or more, very much branched; set with irregularly scattered ramuli. Colour, "when growing, a peculiarly rich green," pale and a yellowish green when dry, and the *stems* then look as if glazed, but the ramuli do not. This is a more slender and irregular

branched plant than the preceding, not uncommon in many places from Orkney to Cornwall. Annual. Summer. Grows on rocks or on the larger algæ in tide-pools in shaded situations. On the west of Ireland, where, according to Dr. Harvey, it is most abundant, and reaches a size much greater than it attains on the English coast; it is often seen in sheltered bays, growing in thick bunches of extraordinary size and luxuriance on the broad-leaved variety of Laminaria saccharina. "These are never exposed at low water, and can only be reached in a boat; but in shady channels and pools between tide-marks, even at some distance above the low water limit, specimens of nearly equal size, attached to smaller algæ, are frequently met with."

VAUCHERIA.

Named in honour of M. Vaucher, a distinguished writer on fresh water Confervæ.

Fronds aggregated, tubular, continuous, capillary,

coloured by an internal green pulvurulent mass. *Fructification :* dark green *coniocystæ* attached to the frond.—*Grev.*

VAUCHERIA MARINA.—MARINE VAUCHERIA.

"Fronds tufted, or somewhat spreading, erect, very slender, and flaccid, irregularly branched, somewhat forked; the branches erect. *Vesicles* few, scattered, broadly obovate, and very obtuse, by which character it is easily distinguished from V. submarina. Colour a bright green, becoming rather brownish, but retaining a gloss in drying." Annual. Summer. Parasitical on Furcellaria fastigiata at Appin, Argyleshire. On mud at Torquay and Salcombe, Devon.

O. S. *V. submarina.* On the muddy seashore. Rare. Weymouth. "Tufts two or three inches high, not diffused, fastigiate. Vesicles numerous."

V. velutina. On muddy sea-shores. Annual. Spring and summer. Appin, Argyleshire. Miltown Malbay, west of Ireland. "Filaments interwoven into a dense, velvety, green stratum, pellucid below, and creeping over the mud; branches near the extremity erect."

CONFERVACEÆ.—CONFERVA TRIBE.

Green, marine or fresh water algæ, composed of articulated threads or filaments, simple or branched, free or surrounded by gelatine. *Cells* cylindrical, truncated.—*Harv.*

The greater number of the plants of this tribe are found in fresh water: three genera alone contain strictly marine species. In the first, Cladophora, a few examples only, inhabit streams; while the majority of the Conferva grow indifferently in running or stagnant water. Cladophora contains upwards of a score of species indigenous to the shores of Britain: they require to be examined in a

recent state; for, when dry, it is not at all easy to discriminate them. To the learner, they are a puzzling genus; and very little knowledge can be gained of them without the constant employment of the microscope. In the comparative length of the joints and manner of branching, as well as in the size and substance of the filaments, are deduced some of the specific characters. In the summary of the species, the reader will find indicated all their most striking specific distinctions.

MARINE GENERA OF THE CONFERVA TRIBE.

Cladophora. Filaments tufted, much branched.

Rhizoclonium. Filaments decumbent, with root-like branches.

Conferva. Filaments unbranched.

CLADOPHORA.

Name, signifying *branch-bearing.*

Filaments green, attached, uniform, branched; composed of a single series of cells or articulations. Fruit aggregated: granules or zoospores, contained in the articulations, having at some period a proper ciliary motion.—*Harv.*

CLADOPHORA RUPESTRIS. — DARK-GREEN ROCK CLADOPHORA.

Tufted, from three to six inches high; very much and closely branched; rigid, very dark green, with erect close-pressed ramuli. Grows abundantly on rocks between tide-marks.

CLADOPHORA LÆTE-VIRENS. — LIGHT-GREEN BUSHY CLADOPHORA.

Tufts four to eight inches long, much branched, of a fine transparent yellow-green colour when

growing; without gloss, and grayish when dry; branches erect, spreading; uppermost ramuli secund. Annual. Summer. Frequent on rocks, stones, and algæ in tide-pools.

SUMMARY OF THE BRITISH MARINE SPECIES OF CLADOPHORA.

C. Brownii. Grows in situations exposed to the dripping of fresh water, and the occasional overflow of the tide. In a cave near Dunree, North of Ireland; and in one near Black Castle, Wicklow. Cornwall coast, near the Land's End. Forms cushion-like tufts; erect, rigid, of a black-green colour when growing; "but, on having the water expressed and held to the light, exhibits a beautiful yellow-green colour." Dr. Harvey describes it as a very curious and distinct species; to the naked eye, having a good deal the appearance of Vaucheria terestris, but totally different in structure, and perhaps allied to *C. œgagropila*, a curious plant found in fresh-water lakes.

C. repens. Thrown on shore after a gale. Jersey. Very rare. Miss Turner. Annual? Summer. "Tufts an inch or two in diameter, and about half an inch thick; composed of slender filaments densely matted together. The habit is very similar to C. Brownii, but the articulations are of much greater length, and different in form."

C. pellucida. Grows on rocks near low water-mark. South of England. Yarmouth. Falmouth and Mount's Bay, Cornwall. Several places in Ireland. Very fine in Belfast Lough. Filaments four to six inches high; rigid, erect, forked, and furnished with tufted ramuli. Articulations many times longer than broad. Colour a fine glossy green, which fades in drying. It adheres but imperfectly to paper.

C. rectangularis. Thrown up from deep water. Very rare. Summer. Torquay. Dredged in Roundstone Bay. Cunnemara, in four to six fathoms water, very abundant. Isle of Great Arran, in Galway Bay. Filaments as thick as horse-hair; eight to twelve inches long; rigid,

irregularly branched, branches spreading, with horizontal *opposite* ramuli. Colour a full green, fading in the herbarium. Articulations uniform throughout, usually twice or thrice as long as broad. "One of the most beautiful and distinct, as it is the rarest, of the genus."

C. Macallana. On the sandy bottom of the sea, in four to ten fathoms water. Annual. Summer. Dredged in Roundstone Bay, abundantly. "This has much the outer habit of C. rectangularis, mixed with which it often occurs at Roundstone, but may at once be known by the *secund* or *alternate* ramuli. It is named in honour of its discoverer, the late Mr. William M'Calla, a most successful and acute explorer of Roundstone and the neighbouring bays, who added many new species to the Fauna and Flora of Ireland, and whose early death is much to be regretted. Mr. M'Calla fell a victim to the cholera, in May, 1849." —*Harv.*, Man., p. 200.

C. Hutchinsiæ. Grows on rocks, &c., near low water-mark. Rather rare. Bantry Bay. Belfast

Bay. Larne. Ardrossan and Saltcoats, Ayrshire. Tor Abbey and Salcombe, south coast of Devon. Falmouth Bay.

Colour deep glaucous green, "with changeable tints when fresh, and under water appearing almost white" (Miss Hutchins). "Closely allied to C. diffusa; but the filaments are of greater diameter, the ramuli more abundant and shorter, and they are also shorter and generally contracted at the dissepiments."

C. diffusa. Grows on rocks, &c. Not uncommon. Sidmouth. Torbay. Falmouth. Near Swansea. Aberfraw. Malbay. West of Ireland. Port Rush. "Filaments six to ten inches long, as thick as horse-hair; loosely tufted, generally so rigid as to bristle out when removed from the water, but occasionally flaccid, very flexuous, distinctly branched, branches alternate, usually furnished near the top with a few patent secund ramuli. Colour either grass green or dark green.

C. nuda. Grows on basalt rocks in the sea. Port Stewart. Filaments tufted two to three inches

high, slender, very straight, dull green, olivaceous when dry. In the straight filaments and erect ramuli, "it resembles," says Dr. Harvey, "C. rupestris, but differs in colour, and in the great length of the joints." A doubtful species, which may perhaps prove only a variety of C. rupestris.

C. Magdalenæ. — *Phyc. Brit.*, Pl. 355., A. Found at Jersey, by Miss Magdalen Turner. "Filaments, in the only specimen examined, about an inch long, matted together but not tufted, apparently growing either prostrate or entangled among the bases of other algæ, not much branched. Colour a dark dingy green. Unlike as it is in general aspect and ramification to C. rupestris, the cells under the microscope strongly resemble those of that species; yet I can hardly think it next of kin to that straight growing plant, and perhaps C. fracta is more nearly related."—*Harv.* in *Phyc. Brit.*

C. rupestris. See description.

C. lætevirens. Ditto.

C. flexuosa. In salt-water ditches, near Yar-

mouth. In the sea, not uncommon. Torquay. Falmouth, Miss Warren. Ballycastle, and several places on the east coast of Ireland. "Filaments four to eight inches long, remarkably flexuous, rather harsh to the feel." Dull green, rigid, and slightly branched.

C. gracilis. In deep water, and on rocks and algæ. Torquay. Falmouth, Miss Warren. Youghal. Belfast Bay. Ballantrae, Ayrshire. Tufts from six to twelve inches long. "The only species which can be confounded with it are C. flexuosa, than which it is more luxuriant, more glossy, and more branching; and C. Macallana, which is softer, more flaccid, and much more slender and delicate."

C. Rudolphiana. Parasitical on Zostera, Laminariæ, and other algæ, in two to six fathoms, very abundant in Roundstone Bay, Cunnemara. On Flushing Quay, in Falmouth Harbour, "but only once," Miss Warren. Annual. Summer. "Filaments six to twenty inches long, exceedingly slender and soft, forming beautifully silky, bright green, sub-gelatinous tufts. A much more slender plant

than C. gracilis, with longer joints and more attenuated ramuli."

C. refracta. Grows in rocky pools left by the tide. Torbay. Falmouth. Mount's Bay. Ilfracombe. Jersey. Giant's Causeway. Howth. Balbriggan. Mangan's Bay, co. Cork. Dunlecky Castle, Kilkee. Filaments capillary, three to five inches long, very much branched, bright green. "This beautiful plant is nearly allied to C. albida, but the filaments are coarser, and far more rigid, standing out from each other when the tuft is removed from the water; the colour is a brighter and fuller green; the ultimate branches are shorter and more patent, often strongly reflexed, and the general habit is by no means spongy. It appears to prefer the clearest and purest water, growing on the bare rock or among corallines in deep cold pools left by the tide, near the extreme of low water-mark."

C. Balliana. Phyc. Brit., Pl. 356. Sea shores, at Clontarf. Filaments finer than the human hair, from six to eight or ten inches long, tufted and much branched, the branching repeatedly alternate,

but irregular and difficult to trace, with a more or less evident leading stem. The length of the cells in the principal division is from eight to ten times their diameter, or perhaps more; in the ramuli the cells are shorter. "C. Balliana is readily known from all its British congeners but one, by the tenuity and lubricity of the filament, in conjunction with the great length of the cells. The only one with which it can be confounded is C. Rudolphiana, but the ramification is so different in that plant, that notwithstanding its near agreement in the length of the articulations and the general aspect of the tufts, there can be little difficulty in distinguishing one from the other."—*Harv.*

C. albida. Grows on rocks and the larger algæ, below half-tide level. Frequent. Filaments very slender, flaccid, two to six inches long, pale green, fading greatly in drying, and without gloss. The soft and slender filaments, and uniformly short joints, distinguish it from the common species.

C. lanosa. Grows on rocks, or more frequently on the larger Fuci. "Filaments forming small,

entangled, woolly tufts, an inch long, pale green. Very closely related to C. arcta and C. uncialis, from the former of which it differs chiefly by its smaller size and less branching filaments, and from the latter more by habit than by any very decided character."

C. uncialis. Grows on rocks near low water-mark. Torquay. St. Michael's Mount, Cornwall. Aberystwith. Newcastle, coast of Down. Rathlin, Antrim. Common at Balbriggan. Rocks beyond Kingstown. Malahide. Malbay, west of Ireland. Jersey. Orkney. Tufts an inch high, dark green, spongy. "This," Dr. Harvey remarks, "more nearly resembles C. lanosa than any other of our native species, and sometimes cannot be readily distinguished without a close examination; but it forms much more dense and spongy tufts, which finally become more intricately woven together; and the apices are seldom so distinctly fastigiate as in that species. The habitat in which C. uncialis occurs affords an additional clue. It usually frequents rocky places, growing on the rock itself, or

among the thin coating of sand which covers it, or places close to the edge of low water-mark. C. lanosa, on the contrary, is almost always found a parasite on other algæ; or else attached to pieces of wood, and to the leaves of Zostera." The filaments are much slenderer than those of the following kind, which it a good deal resembles, and it is likewise a much smaller growing plant.

C. arcta. Grows on exposed rocks, generally above half-tide level. Frequent. Filaments forming broad somewhat starry tufts, of a full green colour; much branched. *Substance* soft and retaining water. In the dry state young specimens have a glistening appearance; old ones, on the contrary, are without gloss, except the young shoots toward the summit; woolly, and considerably faded.

C. glaucescens. Grows on rocks and tones between tide-marks. Annual. Summer. Not uncommon. Torquay. Falmouth Bay. Mount's Bay, Cornwall. Mangan's Bay, co. Cork, Portmarnock. Rocks beyond Kingstown harbour,

abundant in May. Filaments densely tufted, very slender, two to four inches long. When dry, the colour is sometimes a pale green, sometimes darker, and the filaments preserve a slight gloss. Its peculiarly glaucous colour, when fresh, joined to the slenderness of the filaments, and the uniform length of the articulations in all parts of the stem, are characters by which it may be easily known.

C. falcata. Grows at the bottoms of clear rock-pools, near low water-mark. Annual. Summer. Rocks outside Dingle harbour, Kerry. Jersey. "Filaments densely tufted, three to four inches long, thicker than human hair, nearly equal throughout, much branched; the branches curved and twisted; the lesser divisions and ramuli frequently incurved, arching, or strongly hooked inwards; the whole plant crisp and squarrose. Colour a peculiarly rich glossy green. Substance rigid, adhering to paper in drying."

C. Gattyæ. Growing probably on rocks near low water, but the locality is uncertain.—Phyc. Brit., Pl. 355 B. This is a doubtful species found

by Mrs. Gatty, and described in the Phycologia as resembling externally somewhat C. uncialis and Ectocarpus littoralis; but the threads are very much more robust than in the former, and differently branched from the latter, as well as more robust.

RHIZOCLONIUM.

Name, meaning a *rooted branch.*

Filaments green, jointed, uniform, decumbent; simple or spuriously branched; branches short and root-like. Fruit granules contained in the cells.—*Harv.*

RHIZOCLONIUM RIPARIA.—TWISTED RHIZOCLONIUM.

Filaments very slender, entangled, and flaccid; slightly branched above, and with a few root-like branches below. This forms wide dense strata, of a pale green colour, spreading over sand-covered rocks near high water-mark. Not uncommon.

O. S. *C. Casparyi.* Phyc. Brit., Pl. 354 B. Falmouth. Penzance. Forms a thin web, of a light green colour. Filaments more slender than in the above; gracefully *curved* rather than twisted.

CONFERVA.

Name, from *conferruminare*, to consolidate, because some of the species were used by the ancients for binding up fractured limbs.

Filaments green, attached or floating, unbranched; composed of a single series of cells or articulations. *Fruit:* aggregated granules or zoospores, contained in the articulations, having at some period a proper ciliary motion.—*Harv.*

CONFERVA MELAGONIUM. — STIFF UPRIGHT CONFERVA.

Filaments five or eight inches high; seldom more than three or four springing from the same root, thick and wiry. Colour a dark green. Grows on

rocks at the extreme verge of low water-mark. Annual. Summer. Generally distributed, but not very frequent anywhere.

CONFERVA ÆREA.—BRITTLE CONFERVA.

Filaments three to twelve inches long, tufted; of much less diameter than in C. Melagonium, and of a yellow-green colour. It differs also from the foregoing, in breaking easily at the joints; the colour fades considerably when dried. Grows on sand-covered rocks and in sandy pools. Annual. Summer. Frequent.

O. S. *C. arenosa.* On the flat sandy shore about half-tide level. Appin, Argyleshire. Bantry Bay. "This species occurs in places a yard or more in extent, and of a peculiar structure. They consist of several exceedingly thin layers placed over each other, but so slightly connected that they may be separated like folds of gauze, to the extent of many inches, without the least laceration."

C. tortuosa. Grows on rocks and algæ. Common. Filaments rigid, slender, much curled and twisted; forms closely interwoven strata, several feet in diameter, of a pale or full green colour. Articulations two or three times longer than broad.

C. implexa. Grows on rocks and algæ. Torquay, Gwyllyn-vase Bay, Falmouth, Mr. W. P. Cocks. Mount's Bay, Cornwall. Berwick. Frith of Forth. Miltown Malbay. Filaments very slender, flaccid, half as thick as C. tortuosa, with stouter joints; forms densely interwoven strata, or little tufts on the branches of other algæ.

C. collabens. At Yarmouth, on a floating piece of deal. "Filaments three or four inches long; twice as thick as those of C. ærea; of a splendid verdigris-green colour, which is fully preserved in drying; very gelatinous, adhering most closely to paper." This species is believed to have been only once found by Sir W. J. Hooker.

C. bangioides. Grows on submarine rocks, &c. Torquay. Breakwater, Plymouth. Port Ballan-

trae, north of Ireland. Tufts three to six inches long; soft and lubricous; of a dark green colour.

C. Youngana. Grows on rocks, &c., near high water-mark; first discovered by Mr. W. W. Young, near Dunraven Castle, Glamorganshire. Filaments an inch long, tufted straight, of a bright green colour. "Articulations variable in length, at first cylindrical, afterwards becoming contracted in a bead-like manner."

ULVACEÆ.—ULVA TRIBE.

Green or purple, marine or fresh water algæ, composed of small polygonal cells, forming expanded membranes, or membranous tubes; very rarely arranged in filaments.—*Harv.*

The marine plants comprised in this tribe have thin membranous, often expanded fronds, of a flat irregular form, or sometimes hollow and tubular. When examined under the microscope, the cells of the surface appear arranged in regular squares, like

mosaic work; the spores are formed one or four in each cell, from the *endochrome* or colouring matter contained therein. The colour of the "green sea-shore" is chiefly owing to the abundance of such common species as Ulva latissima and Enteromorpha compressa; they, as well as the Porphyræ, are equally frequent on the shores of the Arctic and Antarctic oceans. The latter genus differs in its *purple* colour from others of this series, but resembles the grass-green sea-weeds in respect of fructification and structure. Their fronds are gathered on our coasts, and boiled down into "laver," which forms a wholesome and agreeable vegetable. In its prepared state it may be preserved for an indefinite time in closed tin vessels; and in the absence of other vegetables, Dr. Harvey believes it would become a valuable article of diet to the crews of our whaling vessels cruising in high latitudes, where every marine rock at half-tide level abundantly produces it. Bangia, a genus which contains two or three marine species, with filamentous fronds, of a dull purple colour, consisting

of one or several rows of cells, appears doubtfully to belong to this tribe, therefore it is not included in the following pages.

MARINE GENERA OF THE ULVA TRIBE.

Enteromorpha. Frond tubular, simple or branched; green.

Ulva. Frond leafy; green.

Porphyra. Frond leafy; purple.

ENTEROMORPHA.

Name meaning *entrail-like*, in allusion to the form of the fronds.

Frond tubular, hollow membranaceous, of a green colour, and reticulated structure. *Fructification:* three or four roundish granules, aggregated in the reticulations.—*Grev.*

ENTEROMORPHA CORNUCOPIÆ.—CORNUCOPIA-LIKE ENTEROMORPHA.

"Fronds gregarious, about an inch long, funnel-shaped, from a short, tubular base, expanding into a plaited, laciniated membrane, torn and jagged at the extremity. Granules in fours, all over the frond. Colour dark green below, pale above."—*Carmichael.* Grows on corallines, &c., in rocky pools left by the tide. Annual. Spring and summer.

ENTEROMORPHA INTESTINALIS.—INTESTINE-LIKE ENTEROMORPHA.

Fronds at first attached by a small root, afterwards detached and floating, curiously curled and inflated, long and tapering at the base, never in the least degree branched. Colour a fine green, soon fading when dry. Grows indifferently in the sea, brackish or fresh-water ditches. Very common. Annual.

ENTEROMORPHA COMPRESSA.—COMPRESSED ENTEROMORPHA.

Fronds from six to twelve inches long, varying greatly in breadth. In the variety β *prolifera*, the frond is narrow, with many slender branches; much contracted below, gradually widening upwards, and obtuse at the tips, by which character, it is stated, this variable plant may be known from the four next species; the broad varieties which very nearly resemble some forms of E. intestinalis, are distinguished from that species by being always *branched*, though often very slightly, whereas the latter is invariably *simple*. Colour a pale or full green. Grows on rocks and stones between tide-marks, very frequent, especially where fresh-water streams run over the beach. Annual. Spring and summer.

O. S. *E. Linkiana*. In the sea at Appin, Argyleshire. Annual. Summer. "Frond cylin-

drical, six to twelve inches in length, tubular, filiform, reticulated, pellucid, of a very pale green colour, membranaceous (rigid when dry), much branched, branches attenuated."

E. erecta. Grows on rocks in the sea, about half-tide level. Annual. Spring and summer. Not uncommon. "Frond cylindrical, four to eight inches high, filiform, slender, highly reticulated, branches erect, opposite or alternate, set with capillary ramuli, all attenuated to a fine point." A very variable plant, not always easy to distinguish from the next species.

E. clathrata. Grows between tide-marks. Annual. Spring and summer. Not uncommon. Brighton. Torquay. Falmouth. Belfast Bay. Appin, Argyleshire. Frond four to twelve inches high, cylindrical, filiform, slender, highly reticulated; branches spreading, much divided, set with divaricated or recurved ramuli."

E. ramulosa. Grows on rocks between tide-marks. Annual. Spring. Not uncommon. Fronds five or six inches to one or two feet long, com-

pressed, curled or twisted, much and repeatedly branched and interwoven into a (more or less) thick and inextricable mat, everywhere covered with spine-like branchlets, which makes this species rather harsh to the touch, and distinguishes it from E. clathrata, which has a soft and silky feel.

E. Hopkirkii. Dredged in four to ten fathom water. Annual. Summer and autumn. Goodrington, Torbay. Carrickfergus. "Fronds six to twelve inches long or more; of exceeding fineness and delicacy. It rivals, in the tenuity and beauty of its frond, and in their bushy branching, the most delicate Cladophoræ; having, to the naked eye, an aspect not very unlike that of C. Rudolphiana, and being more slender than C. gracilis. Under the microscope, it is known by the very large size of its nearly empty cells, in the centre of which a small spherical grain of emerald green endochrome is found. The ramuli are so slender that they consist of a single row of such cells, and thus have something the character of the threads of a Conferva." The late Mr. M'Calla named this species

in honour of Mr. T. Hopkirk, author of the "Flora Glottiana." Specimens of it were first discovered by Mrs. Griffiths in Torbay, in 1838; and it was not till 1845 that Mr. M'Calla found the plant at Carrickfergus.

E. Ralfsii. Discovered at Bangor, North Wales, by Mr. Ralfs. Larne. "Frond capillary, simple, or having a few short, spine-like ramuli; nearly solid; laxly reticulated; the cells large, hyaline (two to four in the breadth of the frond), each cell containing a brilliant grain of colouring matter."—Harv. Man. 2nd ed., p. 215; the description under the head of E. percursa given therein belongs to this species.

E. percursa. On the oozy sea-shore, above half-tide level, spreading widely. Annual. Spring and summer. Common at Appin, Argyleshire. "Frond very slender; capillary compressed, marked with spurious reticulations, and a central longitudinal line."—Harv. Man. 1st ed., p. 176.

ULVA.

Name supposed to be from the Celtic word *Ul*, water.

Frond membranaceous; of a green colour, plane, in some cases saccate and inflated in the young state. *Fructification:* minute granules mostly arranged in fours.—*Harv.*

ULVA LATISSIMA.—WIDE ULVA.—"GREEN SLOKE."

Frond six to eighteen inches long, and several inches wide; broadly egg-shaped or oblong; variously cleft and waved; of a full green colour. Fructification distributed over the whole frond. Grows on rock and stones between tide-marks. Very frequent. Annual, but found at all seasons. It is said to be sometimes eaten when cooked in the same manner as *laver*.

ULVA LACTUCA.—LETTUCE ULVA.—"OYSTER GREEN."

Fronds three to six inches in length; when young, like a round bag, then bursting and tearing into many irregularly-shaped segments. A smaller and far more tender plant than the preceding; of a pale yellow-green colour, and adheres closely to paper. Grows on rocks, stones, corallines, &c. Annual. May and June. Generally distributed round the British coasts, but less common than L. latissima.

ULVA LINZA.—ENTEROMORPHA-LIKE ULVA.

Fronds clustered, six inches to two feet in length, half an inch to an inch and a half wide, linear lanceolate, tapering to each extremity, much curled, of a fine grass-green colour. The frond in this species is composed of *two* membranes closely applied, a structure showing an affinity with Entero-

morpha. The wide flattened variety of E. intestinalis may perhaps be at times mistaken for this species; but the former may be known from it by its *obtuse* tips, which in U. Linza are *tapered,* and the colour is a finer and more delicate green. Grows on rocks and stones in the sea. Annual. Summer.

PORPHYRA.

Name, meaning *purple-coloured.*

Frond plane, exceedingly thin, and, owing to the fructification, of a purple colour. *Fructification* 1. scattered *sori* of oval seeds; 2. roundish *granules* mostly arranged in a quaternate manner. —*Grev.*

PORPHYRA LACINIATA.—CLEFT PORPHYRA.

Frond very irregular, cleft, four to eight inches long, or thin and delicate, often fixed by the centre to its place of growth. Colour a fine purple.

Grows on rocks, stones, &c., between tide-marks. Very common. Annual. Spring to Autumn. This and the next species are known under the name of Laver in England; Sloke, or Slokaun, in Scotland and Ireland. After being well boiled, it is eaten with roast meat, and is much liked by many people. In Wales it is fried with oatmeal, and brought to table under the name of "*Laver bread.*" This, I am informed, is very palatable, and is a dish much relished by those accustomed to eat it.

PORPHYRA VULGARIS.—UNDIVIDED PORPHYRA.

This is known from the preceding by being perfectly simple at all ages, instaed of cloven; and the frond is much longer in proportion to its breadth; it is likewise of a brighter colour, but its brilliancy varies in both according to the forwardness of the fructification. P. linearis, of Greville, Dr. Harvey considers only a narrow variety of this species, not

PORPHYRA LACINIATA

distinguished by any constant character. Grows in the same situations as P. laciniata. Annual.

O. S. *P. miniata.* Only once found floating in the sea by the late Capt. Carmichael at Appin, Argyleshire. "Frond solitary, plane, oblong, gelatinous, rose-red. From its texture and fructification, it evidently does not belong to this genus."—Carmichael.

GLOSSARY.

THE *Frond* is a term which when applied to a sea-weed signifies every part of the plant excepting the *root;* and occasionally the *stem,* if well developed and distinct from the other portions of the plant, is not included under this term.

In *form* it may be either—

Capillary, slender and hairlike.

Compressed, when flattened laterally.

Constricted, when drawn together, as if tied.

Continuous, without interruption—prolonged.

Cylindrical, round and elongated.

Dichotomous, or forked, when regularly branched or cleft in two.

Filamentous, slender, and thread-like.

Filiform, string-like—the size of common twine.

Flabelliform, fan-shaped.

Lanceolate, shaped like a lance, narrow, tapering at each end.

Linear, narrow, the same width all along.

Orbicular, circular,—round.

Palmate, shaped like the hand, with the fingers expanded.

Pinnatifid, cut transversely into several oblong segments.

Plane, flat, level.

Proliferous, when a second frond arises from the first, nearly similar to it.

Saccate, double and hollow, in the form of a bag.

Simple, undivided, consisting of one—unbranched.

Terete, round, in opposition to flat.

Tubular, hollow, round like a tube.

Virgate, long and straight, like a wand.

In *substance* the Frond is—

Cartilaginous, stiff and gristly.

Coriaceous, when leathery and tough.

Crustaceous, hard and like a crust.

Flaccid, soft when collapsing on removal from the water.

Gelatinous, jelly-like, consisting of gelatine.

Rigid, harsh, not collapsing on removal from the water.

The *structure* is termed—

Areolated, when the cells are marked out into regular spaces, and resemble mosaic-work.

Cellular, consisting of cells placed laterally as in a honeycomb.

Filamentous, when formed of a string of simple cells placed end to end.

Fibro-cellular, when the cells are firm and elongated, and strung together into threads or filaments.

Reticulate, when marked like net-work, or formed of large, flat, many-sided cells.

The lesser divisions of a filiform frond are called ramuli.

These are often spine-like, hair-like, and bristle-like: sometimes—

Articulate, when jointed throughout.

Accessory, when differing from the ordinary ramuli borne by the plant, and adapted for a special purpose.

Byssoid, arising in dense, slender cobwebby tufts.

Corymbose, or level-topped, when the ramuli are of different lengths, but do not overtop each other.

Distichous, arising in two opposite rows.

Imbricated, tiled, lapping over each other.

Inarticulate, not jointed.

Incurved, bent inwards.

Involute, rolled inwards.

Involucre, ramuli ranged round a conceptacle, forming a more or less perfect whorl.

Multifid, many-tipped.

Pectinate, pointing one way, like the divisions of a comb.

Pinnate, when placed in a distichous manner, and resembling the plumes of a feather.

Pencilled, rayed, like the finer strokes made by a pencil.

Quadrifarious, spreading on four sides.

Secund, unilateral, arising on one side only.

Verticillate, whorled, when set in a circle round the stem or frond.

Terms employed in describing the fructification of the algæ, the seeds of which consist of either simple spores, or of others termed tetraspores.

The former, for distinction's sake, are termed *primary*, and are generally included in conceptacles; the tetraspores, or secondary fruit, usually divide at maturity, into four parts or *sporules*, and are generally placed in *sori* on the fronds, very rarely in proper receptacles.

Capsule, a case containing spores.

Conceptacle, a case containing spores.

Ceramidium, a conceptacle of an ovate form, containing tufts of spores, as in *Polysiphonia*.

Coccidium, a sphere-shaped conceptacle, containing tufts of spores, as seen in *Nitophyllum*.

Favellæ, berry-like receptacles containing spores, as in *Callithamnion*.

Favellidia, round masses of spores immersed, or partly so, in the substance of the frond, as seen in *Iridæa*.

Nemathecia, wart-like protuberances, composed of vertical filaments closely packed together.

Silicules, little pod-like bodies, containing spores.

Sorus, sori—clusters of spores.

Stichidia, pod-like receptacles containing tetraspores, —found on *Rhodomela*.

Tubercle, the same as coccidium.

Antheridia, small cells, filled with *very* minute vivacious granules, supposed to be the representatives in the algæ of the *anthers* of flowering plants.

Diæcious, having *antheridia* and *spores* on distinct roots.

Monæcious, having *antheridia* and *spores* on the same root, but not in the same conceptacle.

Cilium, cilia—*very* minute, hair-like processes which are found on the *spores* of many of the lower algæ, and on the vivacious bodies contained in the *antheridia*.

Explanation of various Technical Terms not comprised in the foregoing.

Acuminate, lengthened out into a thorn-like point.

Adnate, adhering by the whole of the under surface of the frond.

Aggregate, collected or grouped together.

Axil, the angle formed by the insertion of a branch, or a division of a frond.

Axis, the central portion of a cylindrical frond.

Anastomosing (filaments), engrafting into each other.

Cellule, a small cell.

Deciduous, falling off.

Disk, surface of a frond within the margin.

Disk, the small base by which many of the algæ adhere to rocks and other substances.

Dissepiments, the partitions separating the cells of the articulate filiform algæ.

Endochrome, the colouring matter contained in the cells of the algæ.

Flexuous, wavy, bending from side to side.

Free, separate and distinct, also unattached.

Frondlet, a small frond.

Globule, a small round body.

Hyaline, clear, glassy, colourless, the reverse of opaque.

Laciniated, when the divisions of a frond are narrow, and appear as if cut or torn.

Lateral, at the sides.

Midrib, a large vein, which is termed *percurrent* when continuing through the whole length of the frond, *imperfect* when only partly occurring, and *obsolete* when wearing away.

Moniliform, like a string of beads.

Mucronate, having a small projecting point.

Nerve, a faint vein.

Opaque, not transparent.

Ovate, egg-shaped, broad at one end and narrower at the other.

Ob, prefixed to a word, means the reverse form, as ob-ovate.

Patent, spreading apart from each other.

Periphery, the outer layer of cells in a cylindrical frond.

Pedicel, a small stalk—usually applied to the fruit-stalks.

Pinnæ, small branchlets of an alternate or distichously branched frond.

Pinnule, a smaller branchlet springing from the above.

Plumule, a feathered branchlet.

Process, any prominence or projecting part, or small lobe.

Pulvinate, shaped like a cushion or pillow.

Punctiform, dot-like marks.

Pyriform, pear-shaped.

Radicles, small rootlets.

Ramelli, small portions of a ramulus or branch, usually differing in structure from it.

Scutate, shaped like a shield.

Septa, bands, partitions.

Segments, divisions of the fronds.

Subulate, awl-shaped.

Striæ, streaks, narrow markings.

Stipes, the stem of a leafy frond.

Terminal, at the end.

Triparted, divided into three parts.

Quarternate, arranged in fours.

Zoned, marked by rings.

Intermediate characters are expressed by the diminutive *sub*, prefixed to a word; as sub-spherical, not quite sphere-shaped — or by combining two adjectives together; as gelatinoso-cartilaginous, of a partly gelatinous and cartilaginous substance.

DIRECTIONS

FOR COLLECTING, LAYING DOWN, AND PRESERVING SEA-WEEDS.

In collecting sea-weeds, be careful to select those either growing in the pools left by the tide, or that have been recently thrown up by the sea; for after exposure to the sun and air they soon become decomposed, and lose their colour. The best time for procuring sea-weeds is at the very low tides, when many of the rarer species may be found in their several growing-places. Those that grow in deep water, beyond the verge of spring-tides, may be obtained by means of the *Drag* or *Naturalist's Dredge*.* For carrying sea-weeds in, use either a

* The following descriptions of these instruments, extracted from Dr. Harvey's useful little volume, *The Seaside*

basket lined with oil-skin, or a bag of that or any other water-proof material. Many red sea-weeds require the greatest care, and must be laid out as soon as possible; first ascertaining, by the aid of a pocket lens or a microscope (if the plant be minute in its proportions), whether it be in fruit, and if so, of which description, *spores* or *tetraspores*. The

Book, will probably prove acceptable to the reader. "The *Drag* consists of a series of barbed hooks attached to a transverse bar, and connected with a rope. It ought to weigh at least five or six pounds. This is to be dragged along among the leaves of the large sea-weeds, care being taken when the ground is very foul not to allow it to fall into holes among the rocks, in which it would be liable to be caught. By suffering it to drag among the sea-weeds, some of these will be detached, and being caught by the hooks will readily be hauled up; and such leaves often afford a rich harvest The *Naturalist's Dredge* is an iron rectangular frame, made with a scraper at *each* side, and having a bag attached to it in the usual manner. Its handles are moveable, being connected by eyelet-holes with the bars of the frame below, and united where they join above, by a ring and screw, which when wished can be unscrewed, and the whole falls into a small space. The great value of this dredge is that it cannot be overset, each side being the same, and this, when dredging in deep water, is a quality of the greatest value."

laying down process is done in this manner: First wash the sea-weed in fresh water; then take a plate or dish, cut your paper to the size required, place it in the plate with fresh water, and spread out the plant with a good-sized camel-hair pencil in a natural form—a porcupine's quill will be found useful in disentangling the branches (picking out with a pin gives the sea-weed an unnatural appearance, and destroys the characteristic fall of the branches, which should be carefully avoided)—then gently raise the paper with the specimen out of the water, placing it in a slanting position for a few moments, so as to allow the superabundant water to run off; after which place it in the press. The press is made with either three pieces of board or thick pasteboard. Lay on the first board two sheets of blotting paper; on that lay your specimens; place straight and smooth over them a piece of *old* muslin, fine cambric or linen; then some more blotting paper, and place another board on the top of that, and continue in the same way. The blotting paper and muslin should be carefully removed and dried

every day, and then replaced;* at the same time those specimens that are sufficiently dried may be taken away. Nothing now remains but to write on each their name, date, and locality. You can either gum the specimens in a scrap book, or fix them in, as drawings are often fastened, by making four slits in the page and inserting each corner. This is by far the best plan to adopt in a scientifically arranged collection, as it admits of their removal without injury to the page, at any future period, should it be required either to insert better specimens or intermediate species. Some of the larger algæ when dry will not adhere to paper, and consequently require gumming. The following wash, to be applied to them when perfectly dry, has been communicated to me by a botanical friend. "After well cleaning and pressing, brush the coarser kinds of algæ over with oil of turpentine, in which two or three lumps

* An expeditious mode of drying sea-weeds is by means of a heavy, heated flat-iron, pressed over the folds of blotting-paper which rapidly dries away the moisture and, if carefully managed, is said to impair the hue of the specimen but little.

of gum mastic have been dissolved, by shaking in a warm place—two-thirds of a small phial is the proper proportion, and this will make the specimen retain a fresh appearance."

It will be seen from the foregoing directions that a collection of sea-weeds may be formed with very little trouble. Unlike flowers, whose beauty entirely disappears when dried, sea-weeds retain their varied and tender hues unaltered for a length of time. Many of the finer species, from the extreme thinness and delicacy of their substance, present an evenness of surface and a glossy appearance which often lead persons viewing them for the first time to suppose they are paintings—

> "But who can paint
> Like Nature? Can imagination boast,
> Amidst its gay creation, hues like hers?
> Or can it mix them with that matchless skill,
> And lose them in each other, as appears
> * * * *
> In each attractive plant that sucks and swells
> The juicy tide, a twining mass of tubes?"

APPENDIX.

NOTE 1, Introduction, page 15.

The following observations on the Sargassum will, I believe, interest the reader:—

"During the five or six days that we sailed through this Gulf-weed, I hooked on board more than a thousand pieces, and every one of them presented the same appearance; the lower end of the stem had always a whitish decayed appearance, just like a piece of *tangle* which has been some time cast ashore, while the extremities of the branches were universally of a very fresh and healthy appearance; such being the case, we can scarcely help believing that these remarkable plants have existed since the time of their first creation to the present period as we now find them—floating always in this revolving Gulf-stream, and undergoing a perpetual mutation, from the decay at one extremity and growth at the other. There is nothing unreasonable in this opinion, as sea-weeds are not like land plants, which derive nourishment from the spot to which they are attached. I found among the weed a great variety of

zoophytes and other minute marine animals; a crab, from an inch to an inch and a half across, was frequent, —and I observed the nest of one, formed by the small branches woven together by a strong kind of thread, not unlike that of which spiders make their webs; it contained a number of young ones."—*Gardiner's Travels in Brazils*, p. 556. Dr. Johnston, in his Introduction to Conchology, says, "Of the Gasteropods, some appear to have been created expressly to dwell among the fields of floating gulf-weed; for the foot has been lengthened and narrowed, and channelled down its middle, so that it may receive the slender frond of the weed in the furrow, and give a firmer grasp and security to the creature. Of this beautiful adaptation the Scyllæa affords a good example. The habits of the Litiopa are not less worthy of notice. This is a small snail, born amid the gulf-weed, where it is destined to pass the whole of its life. The foot, though rather narrow and short, is of the usual character, and, having no extra hold, the snail is apt to be swept off its weed; but the accident is provided against, for the creature, like a spider, spins a thread of the viscous fluid that exudes from the foot to check its downward fall, and enable it to regain its pristine site. But suppose the shock has severed their connection, or that the Litiopa finds it necessary to remove, from a deficiency of food, to a richer pasture, the thread is still made available to recovery or removal. In its fall, accidental or purposed, an air-bubble is emitted, probably from the bronchial cavity, which rises slowly through the water, and as the snail has enveloped it

with its slime, this is drawn out into threads as the bubble ascends; and now, having a buoy, and a ladder whereon to climb to the surface, it waits suspended until that bubble comes into contact with the weeds that float around!"—p. 134.

NOTE 2, page 8.

Kelp products, copied from the *Inverness Courier*, April 1850:—

"Mr. Paterson of Glasgow has sent to us the following samples of various products obtained by him from kelp. They are described as follows in a note from that gentleman: No. 1 sample, crude saltpetre, produced in my laboratory from nitrate of soda, and from muriate of potash, obtained from my own iodine works, in the consumption of kelp. No. 2, the same produce as No. 1, being a portion of the same experiment submitted to the refining process. No. 3, sample of refined saltpetre, produced from nitrate of soda, and kelp muriate of potash, manufactured on a large scale for commercial purposes, by A. D. & G. Morton, Glasgow. No. 4, sample of potash, produced from the salts of kelp, exclusively, and possessing all the properties of American potash. No. 5, sample of pearlash produced from the salts of kelp, exclusively, and possessing all the properties of American pearlash. No. 6, sample of iodine from kelp by me. No. 7, sample of hydriodate of potash, from iodine

by me. These samples comprehend all the most valuable products of kelp; the common salt and sulphate of soda I do not trouble you with, they being of comparatively little value."

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ERRATA ET CORRIGENDA.

Page
11, for "granulosa" read "granulata."
62, for "termissima" read "tenuissima."
132, for "dasyhyplla" read "dasyphylla."
145, for "Coralline" read "Corallina."
149, for "Mesogloia" read "Melobesia."
190, for "Grymnogongrius" read "Gymnogongrus."
211, for "Odius' Bay" read "Odin's Bay."
284, for "Conferveærea" read "Conferva ærea."
255, at line 8, after "between" insert the word "tide-marks."

O. S. is an abbreviation of the words "Other Species."

Omitted at page 90, the description of Ectocarpus Siliculosus. A common species, resembling in its outward aspect E. littoralis, but rather softer in substance and more feathery in its branching. Microscopically it may always be known by the pod-like fruit, borne on little stalks and narrowed to a sharp point. Annual. Summer. On algæ between tide-marks, and in three to four fathom water.

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